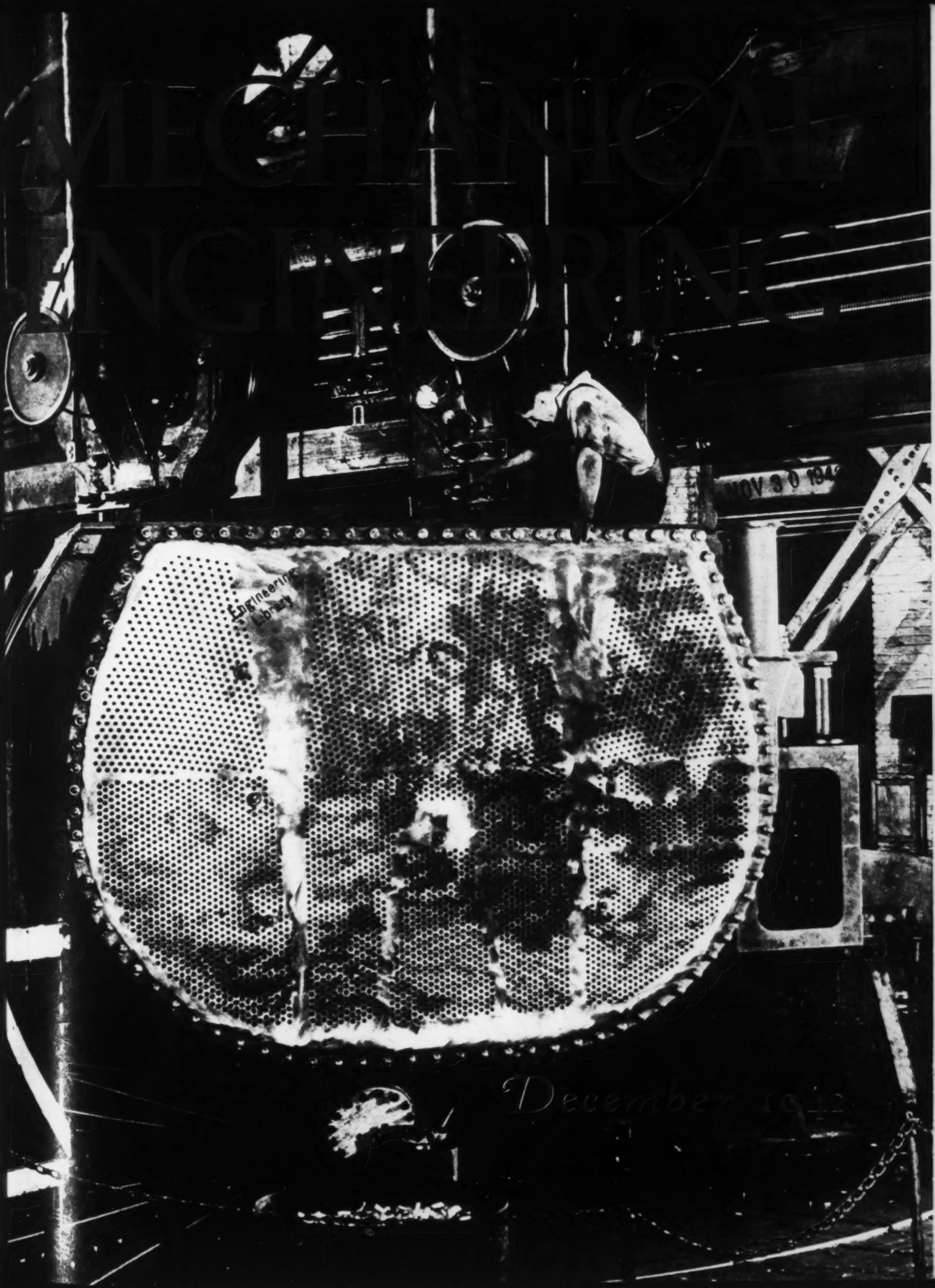
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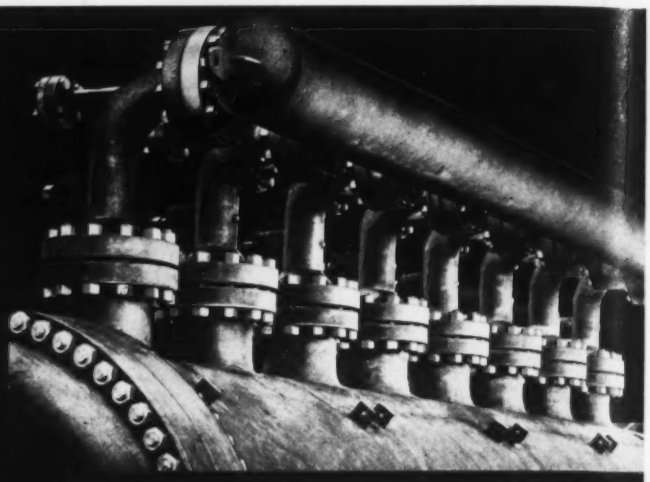

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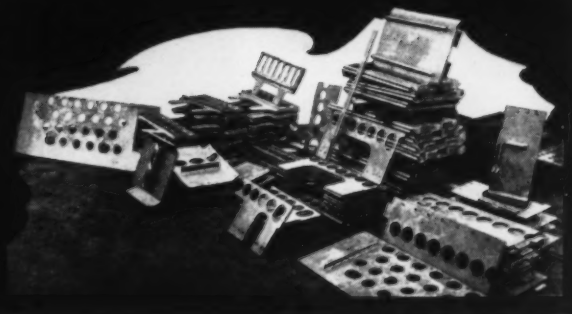

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Still Room for Craftsmanship

(Manufacture of breech-housing mechanisms for antiaircraft guns, used by the Navy and to arm the merchant marine, at a plant of the Fisher Body Division of General Motors.)

VOLUME 64
No. 12

MECHANICAL ENGINEERING

DECEMBER
1942

GEORGE A. STETSON, *Editor*

Toledo Section Did It

IN Toledo, Ohio, the Defense Committee of the Toledo Section of The American Society of Mechanical Engineers has been co-operating with the city engineers in working out an air-raid-warning system. According to Sydney Bevin, chairman of the Section, the committee's work finally developed into the purchase and preliminary installation of 24 steam sirens located so that they give the best coverage to the municipality and surrounding areas. In addition to Mr. Bevin, Norman Anderson, secretary, and Neal W. Dorman, vice-chairman of the Section, Rowland F. Hill, Roland H. Marker, and Harold R. Schutz served on the Defense Committee, whose chairman was Homer L. Yaryan, Jr.

The report shows that four types of warning devices were considered: (1) The independently powered Victory siren, (2) the steam siren, (3) air horns, and (4) electric sirens. The steam sirens were recommended because available factory locations were scattered throughout the city; a large volume of sound with rising pitch was generated by them; the initial cost was lower than for any other type; maintenance costs were low; weights of materials required were lower than for other systems; reliability was good; and it was easy to set up a control system to operate the steam sirens.

The public service rendered by the Defense Committee of the Toledo Section is typical of what engineers in organized groups can do in the communities in which they live. Undoubtedly many other A.S.M.E. local sections and engineering groups can provide other equally impressive evidences of their usefulness and service to their communities. Perhaps also other sections and groups may find in the example here cited a stimulating suggestion they will wish to follow in their own communities. All such cases reflect credit on the engineering profession and help to raise the esteem in which engineers are held by their fellow citizens.

Present-day community life is constantly confronted by engineering problems for the solution of which unbiased engineering judgment is essential. The manner in which engineering groups, such as local sections of national engineering societies, can be of service is not necessarily the same in every case. At one time it may be a job for mechanical engineers, at another for the chemical, electrical, sanitary, civil engineers, or for the metallurgists. In one case a volunteer committee may perform the task satisfactorily and appropriately. At another time preliminary investigation may show that the job should be turned over to a firm of consulting engineers. Two important generalizations seem to apply to all cases. In the first place, a strong, able engineering group, like a local section of a national engineering society, a local engineers' club, or a local engineers' council, must be sufficiently well known and sufficiently alert to be the first source of assistance to which public authorities can turn for help. With the problem before them the local group can decide how it can best be attacked and who are the persons most competent to handle it. In the second place, success is based on the degree of public responsibilty that actuates the group appealed to and the manner in which the group utilizes the engineering method of analyzing the problem, assembling the data, and arriving at a rational and economic solution. The more whole-heartedly engineers serve their communities in the solution of problems of public interest in the fields in which engineers are competent to serve, the greater will be the esteem in which the profession is held by the public.

Man Power

HAVE we enough man power to raise, equip, and maintain an armed force of the size indicated by military authorities, to furnish the amount of aid required by our Allies, and to produce sufficient supplies to meet essential civilian needs? An analysis of this question is available in a small pamphlet, "Is There Enough Manpower?" by Harold W. Metz, published by The Brookings Institution.

How large is the armed force to be? From figures given by Secretary Stimson the number in the Army by the end of 1943 would be 7.5 million and the naval forces, according to Navy officials, 2 million more. Thus the analysis is based on 9.5 million men at the end of 1943 and 12 million in 1945.

Turning next to the quantity of materials we can produce with the labor force that might be made available by increasing the number of persons in the labor force, by increasing the hours of work, and by increasing efficiency, it is estimated that in 1944 our labor force might total 65.1 million, made up as follows: Armed forces 9.5 million, unemployed 1 million, agricultural workers 9.6 million, and nonagricultural workers 45 million. These workers might produce $155 billions, made up of $60 billions of private goods and services, $11 billion government nonwar purchases, and $84 billion war purchases. To get the 6.4 million persons needed we would have to draw into the labor force during the next two years 150,000 Mexicans, 1.6 million retired workers and

school children, and 3.25 million homemaker, in addition to natural increase in working population. Actual hours worked per week would have to be stepped up from 42.5 (1942) to 48 (1944), which would mean actual schedules averaging at least 50 hours; and nonwar activities would be curtailed one third.

For the 12-million-man fighting force, the labor force would have to be increased by 10.4 million from 1942 to 1945, made up of 250,000 Mexicans, 2.4 million retired workers, 5.65 million homemakers, and 2.1 million as a result of natural increase in the population. Production for war purposes is then estimated to be $86 billion.

Lend-lease supplies, now being produced at a rate of $8 billion per year, are not likely to decline in the near future. Hence the question arises whether we can continue to furnish requests and at the same time supply and equip 10 to 12 million of American forces.

On the basis of various estimates and a supply line averaging 4500 miles long, at least 33 million dead-weight tons of shipping, and possibly 45 million, would be required in continuous operation, it is estimated, if we should move and maintain abroad 5 million men in 1943.

Generalizing his conclusions, the author of the Brookings pamphlet says:

"If we are to build up an armed force of 9.5 million men by the end of 1943, the government must immediately make a number of significant decisions and adopt appropriate measures: (1) It must take steps to increase the *actual* working week from 42.4 to an average of at least 46 hours in 1943; (2) efforts must be made to bring at least 6.4 millions of additional workers into the labor force; (3) a drastic curtailment in the output of civilian goods must be undertaken at once; (4) the shipbuilding program must be greatly expanded. . . .

"Decisions involved must be based upon a co-ordinated national policy designed not only to give *balance* within the war production program itself but *balance* between military man power requirements and industrial man power requirements. Responsibility for these decisions obviously rests solely with the President."

A New W.P.B. Office

ACCORDING to a press dispatch from Washington dated November 9, Harvey N. Davis, past-president of The American Society of Mechanical Engineers and president of the Stevens Institute of Technology, has been appointed head of an Office of Production Research and Development, set up within the War Production Board "to insure rapid appraisal and prompt and effective use of new processes, materials, mechanisms, and inventions in the production of war goods."

Donald M. Nelson, W.P.B. chairman, is reported to have stated that the new office "will parallel in the production field the work already being done in regard to instruments of war by the Office of Scientific Research and Development" under Dr. Vannevar Bush. "Except for contracts connected with the rubber program," the announcement declared, "the new agency will make all W.P.B. contracts for research and development work to be done by other governmental agencies, colleges and universities, commercial laboratories, and corporations and others."

The four principal functions of the Office of Production Research and Development were stated to be as follows:

1 To provide the chairman with technical information on problems with which he is directly concerned and on research and development work now in progress in W.P.B. The office is also to provide the W.P.B. divisions and branches with research information and findings on work which they have in progress.

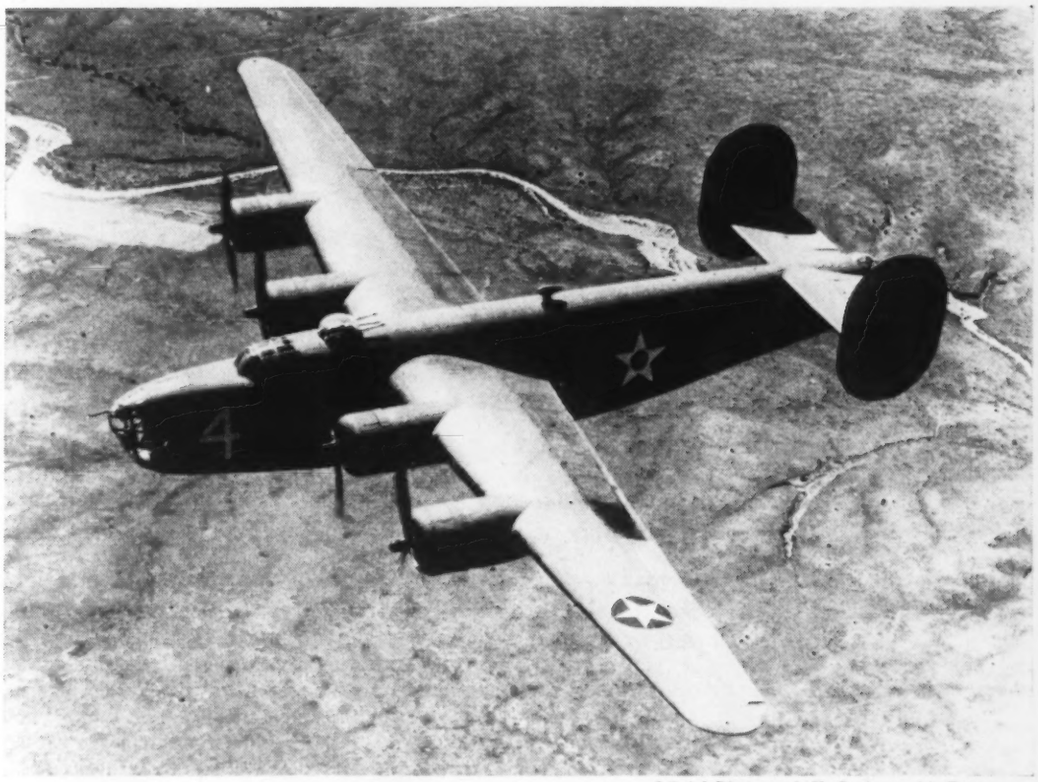
2 To initiate evaluation and analysis of specific scientific or technological proposals, through the establishment of expert committees or through reference to existing research groups in government, education, or industry.

3 To get needed research accomplished by contracting with outside laboratories or agencies for experimental work.

4 To bring about development of such projects or processes as are found to merit it through contracting for the construction of prototypes or the er ection of pilot plants.

The engineering profession and engineering education in general, and The American Society of Mechanical Engineers in particular, are highly honored by the naming of Dr. Davis to head the new office. Dr. Davis is widely known and highly respected throughout the nation. He has a broad background of science and engineering experience, particularly in the field of research, to rely upon. He has energy, persistence, fearlessness; he thinks and speaks clearly and with great force; he knows scientists and engineers and how they think and work; he likes to try new ideas. Anyone who has ever heard him sum up a confused discussion, picking out the essential points and discarding the nonessential, will anticipate that he will discover the kernel of truth and value in any proposition, no matter how well or how ineptly presented, and that he will not be fooled by extravagant and confusing claims, no matter how adroitly and persistently put forward. He combines a talent for objective analysis with the mental agility of a trained debater.

It is too early to predict what the new office may accomplish. Engineers know that in war, as in peace, technology advances so rapidly that those who persist in believing that what we have, regardless of how new or excellent it is, is good enough for tomorrow, are doomed to disillusionment and extinction. Engineers also know that more is needed than a new idea. Research and invention must be followed up by development into practical, economic devices. Machines must be made to work and products must be made to satisfy the demands of the market. This is frequently the longer and the harder task—it is fundamentally the engineer's job. A man who can apply psychology to engineering, who can develop scientific and workable means for sorting potential engineers out of the general run of high-school students, who will set up a powder-metallurgy laboratory in his institution after hearing a paper on the subject, and who will resist the pressure for specialization to the extent of running an engineering school with a single curriculum, has the imagination and good sound sense to pick out promising ideas and see that they are quickly and competently developed.



Official Photograph U. S. Army Air Forces

CONSOLIDATED B-24 "LIBERATOR"

AIRPLANES FIT TO FIGHT

By NATHANIEL F. SILSBEE

MAJOR, U. S. ARMY AIR CORPS

THE exact role of air power in this war may still be a favorite subject for argument but an impressive array of facts indicates its decisive importance in the final victory. Even in 1940 Secretary Stimson said: "Air Power has decided the fate of nations. Germany with her powerful air armada has vanquished one people after another. On the ground large armies have been mobilized to resist her but each time it was that additional power in the air that decided the fate of each individual nation." In the hands of both major Axis powers, not only campaigns on land but sea engagements as well have been profoundly affected by air power; witness Norway, Crete, Coral Sea, and Midway. Sea power has been so revolutionized that a definite trend is seen toward the aircraft carrier as the chief striking force of the Navy.

In defense as well as attack, air power has proved of priceless value. Over Dunquerque and during the air battle of Britain, the Royal Air Force gained local air superiority and stopped the Luftwaffe cold. Last winter the Soviet air force, underrated by the Nazi high command, was a major factor in holding off the enemy. The air blitz on supply lines has seen remarkable examples in the North African campaign and in stopping the ambitious Nipponese in the Solomons and New Guinea.

To gain the air superiority we need, if our side is to win the war, America must have a properly balanced air force. This includes a sufficient quantity of high-quality airplanes—bombers, fighters, reconnaissance, transport. We must have hundreds of thousands of well-trained airmen; and that means not only the air crews, such as bombardiers, navigators, pilots, and gunners but also the ground crews whose important job is to "keep 'em flying." We must have air bases at strategic points, including landing fields, storage and maintenance facilities, housing and technical installations, and all that must be provided to enable a modern air force to carry on. To maintain American air-force offensive actions at the far-flung battle fronts, an air-supply system must be in operation.

On this four-square basis, America's striking power in the air is being built—airplanes, airmen, air bases, air supply.

PROVIDING THE INGREDIENTS

Is this stuff at last really rolling? Our phenomenally expanding aircraft and engine industry, now the biggest industry in the country, is beginning to take care of the airplanes, having already exceeded the rate of 50,000 planes per year, with the quality, as we shall see presently, topnotch. Already, on a

Contributed by the Aviation Division for presentation at the Annual Meeting, New York, N. Y., Nov. 30–Dec. 4, 1942, of THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS.

dozen fronts, the box score demonstrates that our planes are beginning to show their ability to outfly, outbomb, and outshoot the best the enemy has to offer. We have under the test more than a score of new fighters, bombers, and transports. Many of these have already flown but are still on the secret list and are enough to "make the angels gasp." Speeds, fire power, bomb loads, range, ceiling, safety features—all are there. But to keep this edge in quality, the aeronautical-research facilities of the country must be kept in top gear. The enemy is working on this day and night. Our setup includes the aircraft industry, Wright Field, Eglin Field proving ground, Naval Aircraft Factory, and National Advisory Committee for Aeronautics, with its establishments at Langley Field, Va., Moffett Field, Calif., and new engine-research laboratory near Cleveland.

Our training programs under the command of such veteran air officers as Major General Barton K. Yount (Flying Training Command) and Major General Walter R. Weaver (Technical Training Command) have been expanding at an amazing rate, and well-trained air crews and ground crews are coming out by the thousands every month. The daily press gives plenty of examples of how well they are doing their stuff.

Our engineers and construction crews have been busy for well over a year establishing the necessary air bases for action in the main theaters of combat. The results of one of these are seen in the recent air action in the Aleutians, others in the constantly stepped-up tempo of the daylight bombing raids over western Europe.

Major General Harold L. George's Air Transport Command, starting with a couple of officers and clerks in June, 1941, as the Air Corps Ferrying Command to fly lend-lease equipment from the factories, has now become a 'round-the-world air service for men, material, and mail which already surpasses the combined operations of all the air lines in the world. Four great airways have been established, and thousands of airplanes, key personnel, and millions of pounds of vitally needed supplies for our six-continent air force and other fighting units have been flown to the various fighting fronts with an amazing record of safety. Air supply, a long-established principle of American air doctrine, is rapidly becoming a vital factor in world strategy for winning the war.

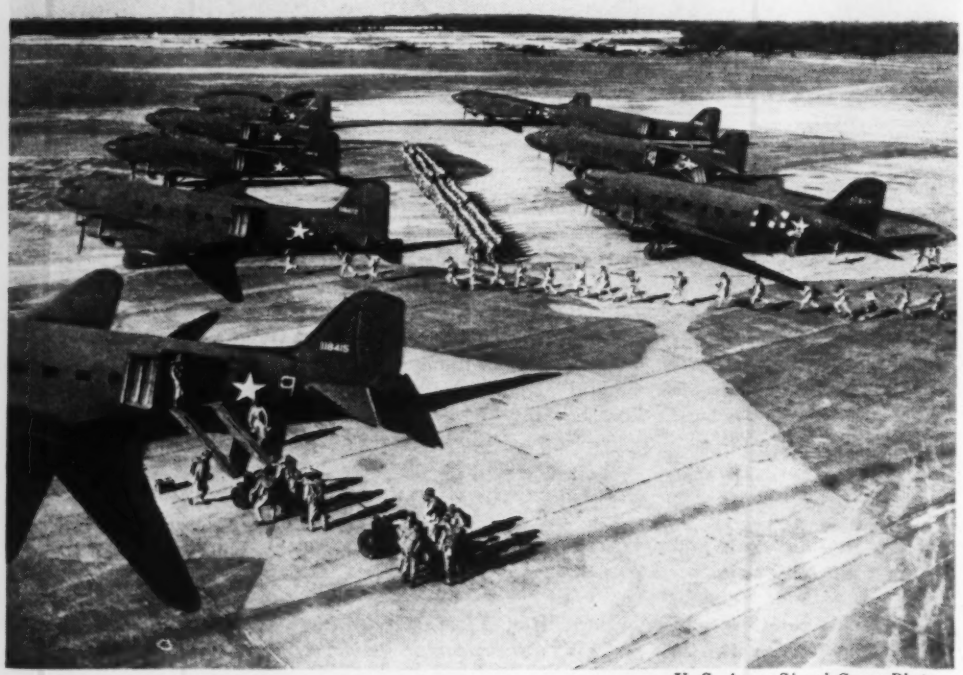
HOW THE AIR FORCE TICKS

As business and professional men it may be that members of this Society would like to have a glimpse of the Army Air Forces setup. The over-all policy is under direction of General Arnold, commanding general A.A.F., and an Air Staff. Recognition by the Army of the decisive importance of air power in all phases of modern warfare is shown in the setting up of a compact air-ground General Staff, about one half of the personnel for which are from the Air Staff.

The next group is the Operations Staff, divided into Military Requirements, Technical Services, and various administrative and management agencies.

Operating directly under the commanding general of the Army Air Forces, eight great commands comprise the last stages of air-force preparation for combat organizations. We have already noted the functions of the Flying Training Command, the Technical Training Command, and the Air Transport Command. The Matériel Command, under Major General Oliver P. Echols, a member of C. E. Wilson's small but powerful Executive Production Committee of W.P.B., procures aircraft and equipment and conducts research and development at Wright Field. According to a recently announced decision, a larger proportion of our available raw materials will go into aircraft. Major General Henry J. S. Miller's Air Service Command operates air depots, repairs and maintains aircraft and equipment, and insures a constant flow of parts and supplies to all units, domestic and overseas. The Troop Transport Command is responsible for transporting air-borne troops and equipment, parachute troops and equipment, and for towing troop and cargo-carrying gliders.

To provide air forces, the final stage is Operational Training. As personnel and aircraft are received from the training schools and factories they are trained as units, with emphasis on the development of smoothly working combat teams. They are then dispatched to task forces and defense commands where they fight under the direct command of an air officer chosen by reason of his training and experience in connection with the particular mission then required. Sometimes this air officer is in command of the entire Army installation, ground and air forces, as in the case of Lieutenant General Andrews in the Canal Zone, Lieutenant General Emmons in Hawaii, or Major General Harmon in the Solomons. On the other hand, sometimes the air officer is under the command of a ground-force officer, such as Lieutenant General Spaatz,



U. S. Army Signal Corps Photo

PARACHUTISTS ARE SHOWN ON WAY TO PLANE FOR TAKE-OFF
(After landing they will help clear the way for air-borne troops in attack on airfield.)

air chief for Lieutenant General Eisenhower, and Major General Kenney for General MacArthur. Under the principle of unified command, sometimes the commanding general of a given area comes under the Navy (Hawaii under Admiral Nimitz, the Aleutians under Vice-Admiral Freeman), and sometimes it is the other way about (as in the Canal Zone, with General Andrews in top command).

These air combat forces include all units of military aviation such as bombardment, interception, observation, ground-air support, together with the necessary maintenance service.

The over-all picture of the Army Air Forces organization may thus be summed up under four key words: policy, operations, commands, forces.

MILITARY AIRPLANE TYPES

What are such balanced air forces expected to do? The basic functions of air power include (1) air attack, (2) air fighting, (3) air observation, and (4) air transport. Air power may be used tactically in co-operation with ground forces or with sea forces, or strategically in independent operations at longer range, either for defense or attack.

Out of the experience in the use to which airplanes have been put in warfare, certain types have emerged, corresponding to these functions. The main combat types are bombers, including heavy bombers, medium bombers, and light or attack bombers; and fighters, including medium-altitude ground-co-operation fighters, light fast-climbing interceptor fighters, and speedy powerful high-altitude longer-range fighters for top cover convoy for friendly bombers.

Service types are observation planes, cargo, and transport, and trainers, including primary, basic, advanced single-engine (for fighter-pilot training), and advanced twin-engine (for training of bomber pilots, bombardiers, navigators, aerial gunners, etc.). For the most part in the remainder of this paper we shall consider only the combat types. Types are more or less fixed, but models change rapidly. Heavy bomber is a type; B-17E is a model

Success in the race for air supremacy depends upon quality. In the long run inferior planes are worse than none. In 1940 the outstanding event in the war in the air was the battle of Britain. The hitherto invincible *Luftwaffe* was turned back, largely because of the edge in speed and fire power of the 8-gunned *Spitfires* and *Hurricanes* over the *Messerschmitt* 109's and *Heinkel* 112's, despite the overwhelming quantitative superiority of the Nazis. The wholly unsuspected quality of the Soviet fighters, such as the speedy I-26 (sometimes called the MIG-3, combining the initials of the two designers) and the heavily armed and armored IL-2 or *Stormovik* bomber-fighter proved more than a match for the Me-109E fighter and Ju-88 fast bomber one year later.

AMERICAN RECORD

As this is being written, nearly a year after our active entrance into the conflict, sufficient combat experience has been gained to form an estimate as to the quality of American planes under fire. The record is impressive, all the more so because of the initial losses sustained by surprise attack and local treachery, and because much of the equipment which was available during the first few months was largely obsolescent. The speed, heavy fire power, protective armor plate, diving ability, and general ruggedness were fighting qualities which gave Army Air Force bombers as well as fighters an increasing edge in aerial-combat performance. From February 1, to August 1, 1942, the period of greatest disadvantage, during which we were largely carrying on defensive and delaying actions against overwhelming odds, the ratio was 2 enemy airplanes shot down to one of ours. During August and September, American air power began to play a really important part on several fronts; beginning to roll back the Japs in the south Pacific and the Aleutians, helping stall Rommel in Africa, and commencing the eye-opening daylight raids over Europe with our *Fortresses* and *Liberators*. For these 2 months, the ratio had increased to 8 to 1. The Navy and Marine figures are no less remarkable. The principal reason for this change in the situation is the fact that by that time balanced air forces in these areas were being built up. Newer models were available, such as the Boeing B-17E *Fortress*, with stinger tail guns, and the Curtiss P-40F *Warhawk* with higher ceiling than earlier models. Newer types, such as the speedy Lockheed P-38 *Lightning* Interceptor Fighter, with its fast climb, high ceiling, and long range were thrown into action. Balance was rounded out by the appearance in these areas of models already highly successful elsewhere, such as the fast, powerful bomber-fighter Douglas A-20 *Havoc*, hard-hitting medium bombers, including Martin *Martians* (B-26) and North American *Mitchells* (B-25), and long-range 4-engine Consolidated *Liberators* (B-24). A great proportion of these new planes were flown to the theaters of action, and Air Transport Command's increasing flow of cargo planes kept the supply of spare engines and parts coming along. The establishment of the Overseas Division of the Air Service Command completed the picture with its ground technicians and facilities to keep an ever larger proportion of our planes actually in the air. Other factors include combat experience of our pilots and crews and increased skill in handling our deadly .50 caliber guns, both hand-turned and power-turret types.

TIME-TESTED DESIGNS—NEW MODELS

It is not generally realized that most of the first-line military airplanes in the forefront of today's aerial combat are the result of tried and proved designs first brought out six or more years ago, vastly improved as to speed, ceiling, and especially fire power, but still essentially the same airplanes.

In the fighter class are four single-seater low-winged monoplanes which were designed in 1934–1935, flown in 1936, and put into limited production in 1937–1938 (the *Messerschmitt* was in full quantity production). These are the British *Spitfire* and *Hurricane*, the German *Messerschmitt* Me-109 and the American Curtiss *Hawk* P-36, stalwart fighters all, the 8-gunned British jobs having the edge in fire power, the Me-109 in ceiling, and the P-36 in maneuverability. Originally designed for engines of 640 to 850 hp, their successors (*Hurricane II*, *Spitfire V*, Me-109F, and P-40F, *Warhawk*) are now powered by V-type liquid-cooled engines averaging around 1200 hp (Merlin XX and Daimler-Benz 601N). Original speeds averaged 325 mph; now they are between 360–390 mph top speed.

The same story more or less holds for bombers, including the British *Wellington*, German *Heinkel* 111K and the American *Fortress*, all developed in 1934–1935, test-flown in 1936, and still going strong in stepped-up versions, which fly faster and farther with heavier loads of bombs.

In addition to these developments it should be noted that even in the case of planes designed since the beginning of the international crisis, there is often a considerable time lag before a new military airplane can be successfully thrown into battle. For example the powerfully armed Bell P-39 *Airacobra* was designed in 1937–1938, the prototype was test-flown in the spring of 1940, in good production about a year later, and in action on several fronts from early 1942. The fast-climbing Lockheed P-38 *Lightning*, twin-engine interceptor-fighter, was tested in a flight across the country in February, 1939, in about seven hours and a half, including stops for fuel, at about two-thirds throttle, hitting over 400 miles per hour while crossing the Alleghenies. A large number of changes in the prototype delayed quantity production on the P-38E (the model

tentatively selected for combat operation) until the summer of 1941. Operational tests revealed the necessity of eliminating tail flutter at high speeds, other changes in the interests of increased safety were made, and an improved turbosupercharger installed, all of which added up to the P-38G, the model reported in successful action in various fronts during the past few months.

The *Airacobra* and the *Lightning* had design features which have rightly been termed "unorthodox" (one way in which major improvements can be achieved). This is ample justification of a four to five-year board-to-battle record. Another new fighter is the Republic P-47 *Thunderbolt*, which is a more conventional design, though with plenty of distinctive features of its own. Its family tree goes back to the P-35, of which the P-43 was a stepped-up version with a 1200-hp engine and turbosupercharger for high-altitude operation. The P-44 was an improved P-43, with six heavy machine guns, a 1350-hp engine and the latest gadgets available in 1940. The fighter-plane experts at Wright Field passed on to Republic's engineers certain things they wanted in a powerful slugger that would dominate the upper air, and the expensive XP-44 mock-up, good as it was, had to be scrapped. In September, 1940, the XP-47 was designed, and by May, 1941, the prototype was test-flown. Improvements were made, and while production on the P-43 was tapering off, the factory began tooling up for what became the P-47B, with 2000-hp double *Wasp* engine. Speed has been announced as better than 400 mph, ceiling up to 40,000 feet, with six or eight of the same .50-caliber high-velocity machine guns which have proved so devastating in the *Fortress* and *Liberator* heavy bombers. Further testing brought other important improvements, and by spring, 1942, the advanced model P-47D was in limited production. Six months later good production was achieved at the parent factory and begun at a Midwestern branch; it has also been announced that another major aircraft producer is rapidly tooling up one factory to turn out this formidable fighter.

So much for time lag in production, and despite engineering and production short cuts which have become possible in the light of the huge orders which have been placed with the aircraft companies (and some of these have been noteworthy), it is still largely true that there is no substitute for time when it comes to the development of successful military aircraft. In addition to the attainment of a good production rate, however, there are two other factors tending to delay a particular model of a fighter or bomber coming into combat action. The first is the need of building up a reserve after the squadrons have received their initial equipment. A statement recently appeared in *The Aeroplane* (London) to the effect that no new model fighter plane would see combat action until about one thousand were on hand; this may vary somewhat in particular cases. The other fact is the necessity for months of tactical training to insure that perfect teamwork which is largely responsible for winning modern air battles.

THE P-40 SERIES

It may be of interest to follow the evolution of one of these fighter planes and see the nature of the changes which have proved so vital in maintaining combat superiority. The Curtiss *Hawk* 75 (Army P-36) was originally powered by a Wright *Cyclone* 850-hp radial air-cooled engine. Its speed of slightly over 300 mph was somewhat faster than the original Me-109, but slower than the *Hurricane* and *Spitfire*, all of the same vintage; the current Me-109E, just then coming into production, was considerably faster than the original model. The decided edge in speed which the V-type liquid-cooled engine provided for these foreign types helped to swing Air Corps procurement policy toward this type of engine for the fighter planes in its forthcoming expansion program, including the Lockheed P-38, Bell P-39, Curtiss P-40 and North American P-51. The Republic P-43 was to have a 1200-hp radial air-cooled engine, to be followed by the powerful P-47 *Thunderbolt*, as soon as the Pratt & Whitney 2000-hp double *Wasp* was perfected. The highly successful P-36 was slightly redesigned in 1938 to take the new Allison V-1710 (then turning up 950 hp) as the YP-37. The following year, this was developed into the P-40 and, by the spring of 1940, the first of these came off the production line. In the meantime, war broke out and the P-36 was fitted with a Pratt & Whitney *Wasp* engine of 1000 hp and became the P-36A. As the *Hawk* 75A, a fair number of these were sold to the French, and they did excellent service on the western front in the spring of 1940, against the Me-109E and *Heinkel* 112, with a top speed of 330 mph, excellent maneuverability, fast climb, but lightly armed (two .30-caliber machine guns) and with insufficient protective armorplate; altogether a fighter plane which bore the same relation to the more rugged, heavily armed, V-engine-powered *Hurricane*, as the radial Jap *Zero* bears to our present P-40's. The British took over the balance of the French order of *Hawk* 75A's, nicknamed the plane the *Mohawk*, and used them in the early engagements in the Middle East.

TOMAHAWK—KITTY HAWK—WARHAWK

The P-40 turned up a speed of about 360 mph, as compared with the 330 of the P-36A. The air fighting over Europe had demonstrated the need of self-sealing fuel tanks (a German feature) and much heavier armament and protective armor for the pilot, engine, and instruments (British features). These were worked into the Curtiss production line, with a P-40A, B, and C coming along every few months; as rapidly as possible these were sent to the various Fighter Squadrons of our own General Headquarters Air Force and to the British, who called this ship the *Tomahawk*. Many of these were sent to Africa and to the Far East, where they have proved of great value. By the end of 1940, the P-40D was beginning to roll, followed by the P-40E six months later; in each case production on one model tapering off as it started on the next, so that a continuous flow of fighter planes was assured. The P-40D and E were heavily armed with six .50-caliber machine guns and were sufficiently different from the original P-40 as to warrant a new name, *Kitty Hawk;* the Allison engine by this time being rated at 1150 hp, with a 1325-hp rating well along in development.

The *Kitty Hawk* became an outstanding performer in the desert fighting, with its unusually large cooling area and powerful guns for low-flying strafing operations. With its British stablemate the *Hurricane IIB* equipped with light bombs for destruction of ground objectives (the *Hurribomber*), many of the P-40D's became *Kittybombers*. These, together with another Anglo-American team, this time the speedy, powerful twin-engine fighters, the Bristol *Beaufighter* and Douglas A-20 *Havoc*, are authoritatively regarded as in very large measure responsible for stopping Rommel's drive during the summer of 1942. By now the P-40 is showing up as a sturdy all-purpose fighter plane in the same class as the *Hurricane*, and this is emphasized further by its successful use on a great variety of fronts, including Africa, Russia, Burma, China, and the Pacific. The P-40 was not designed as a fast-climbing interceptor, and comparisons with the *Spitfire* and the agile but fragile Jap *Zero* are beside the point. It cannot be too often repeated that all airplane design is a compromise between the flying qualities of speed, climb, maneuverability, and range, and the fighting qualities of fire power, protective armor, rugged construction, and ease of maintenance; and each military airplane model can perform best the job for which it is designed.

One limitation in the P-40 design with the Allison engine is

U. S. Army Signal Corps Photo

ATTACK BOMBERS OF THE GROUND-AIR SUPPORT COMMAND, ARMY AIR FORCES, SWEEP ACROSS LIGHT TANKS OF ARMY GROUND FORCES DURING A PHASE OF DESERT MANEUVERS

(Ground troops practice drawing a bead on the planes with their machine guns. The formation, while not a tactical one, illustrates the combined striking power of ground and air.)

the service ceiling. The P-38 on the other hand, with two Allisons equipped with turbosuperchargers, is definitely a fast-climbing high-flying craft, which with its great speed, powerful armament, and exceptionally long range may turn out to be one of the outstanding fighter planes of the entire war. To add to this country's supply of V-type liquid-cooled engines, the 1210-hp Rolls-Royce *Merlin XX*, used in the *Spitfire* Mark V and *Hurricane* Mark II series, was turned over to Packard for quantity production in 1940. The 2000 plus hp Napier *Sabre* being in the advanced experimental stage but not at that time proved in any operational aircraft is now found in the new, speedy, high-flying *Hawker Typhoon*. The *Merlin XX*, with two-speed blower supercharger, was used in the P-40F, known as *Warhawk*, adding another mile to the 3 to 4 mile ceiling of the *Kitty Hawk*. Reports of the *Warhawk* from various fronts indicate it is one of the deadliest fighters in action anywhere.

ELASTIC PRODUCTION

Military airplanes are not only tailor-made as to types, but during war a feverish struggle is constantly going on to obtain superiority over the enemy. Each change for the better which one side makes, each improvement in speed, ceiling, or armament must be followed as fast as possible by more effective changes in the other's planes. This prevents airplanes from being built on strictly mass-production methods, freezing designs. This is why the aircraft industry has had to maintain the highest possible degree of flexibility in its production, even though it means a somewhat slower production rate. As a matter of fact, the present large-scale orders for planes in 1000 and even 5000 lots, with pooled production and a high degree of subcontracting, has more nearly made this possible than at any time hitherto. Nazi Germany made the mistake of freezing designs on the Me-109 single-seater fighter, the Ju-87 *Stuka*, and other planes to insure overwhelming quantitative superiority. The battle of Britain taught them the lesson, and they are now coming through with the required changes more quickly. One of the factors which has enabled American flyers to overcome terrific odds so far in practically every combat area is the fact that American factories are to a large extent keeping pace with battle-front developments and putting into our warplanes the required changes with a minimum of delay, and yet not interrupting the flow of fighters and bombers to the front. We have already noticed an example of this in the Curtiss P-40 series, and a more recent instance is the transition from the Boeing B-17E to the F, including some 400 minor changes. It so happened that the day the first B-17F came off the line the last of the B-17E's was being delivered, and the total for that month instead of dropping off was slightly increased.

LIFE OR DEATH CHANGES

Here is the kind of change that must be provided for. For example word comes back from Egypt that the landing gear on a certain bomber is causing too many crack-ups, or maybe two of the .30-caliber guns should be replaced by .50's, and certain changes are suggested. Many of our large aircraft and engine companies such as Douglas, Lockheed, and Wright Aeronautical have expert trouble-shooters in the important theaters of action, and in co-ordination with Army Air Force officers on the spot the word gets back quickly. Until the change can be made in the production line proper, which may take several weeks, each airplane is flown to a modification center where the change is made before the plane is flown to the front. There are several dozen of these modification centers located in various parts of the country. Some of these are operated by our principal aircraft producers, some by skilled crews of our nation's domestic air lines, and a few by air force personnel at the various air depots.

The philosophy of the modification center is simple. As one officer puts it: "Suppose you make kitchen stoves. Your factory is all tooled up for one model on a quantity basis and you're turning out thousands of them. Then your head salesman tells you that you've got to add another gadget or your competitors will run you out of business. Which is easier—retooling your whole plant or adding another shop where the gadget can be installed on the stoves before they meet their competition?" This permits up-to-the-minute developments to be incorporated in combat aircraft without interrupting the flow of production. In this connection Capt. Eddie Rickenbacker had an excellent word of advice on his return from an inspection of our new air bases in England. He urged that every major aircraft company

send its chief engineer and production manager to the more important fronts at least once and preferably twice each year; with these fronts only a few hours away by transport plane this should be feasible, and the results would pay richly. In air warfare, time is priceless.

GROOMED FOR BATTLE

Another function of the modification center is that of adapting our planes for special jobs, such as the Doolittle raid, or for certain combat areas where special conditions are encountered. For example, North American B-25 *Mitchells* are painted a dusty pink for service on desert fighting fronts, and this hard-hitting medium bomber as well as other planes for this front are fitted with extra fine filters to keep out as much of the sand as possible. Other types of ships have to be adapted for operation under Arctic conditions. One of the outstanding examples occurred before the modification centers were developed, but it illustrates the urgent necessity of "must" alterations being worked into our combat aircraft. It is well known that the Japs found no tail guns in the *Fortress* B-17's they met over the Philippines, mostly B-17C's and D's. Even though the Jap guns downed very few of these big craft in flight, owing to their speed and amazingly rugged construction, our combat crews out there clamored for tail guns—and they got them in record time. The Nip pilots didn't know what struck them, and it is reported that nearly a hundred of them were downed before a single ship was able to get back and tell the others what was happening. From the battle of Midway on they have kept a healthy distance from our *Fortresses*, and history is repeating itself on the western front with Goering's picked aces in Focke-Wulf 190's.

WHICH PLANES ARE BEST?

As the war in the air proceeds, there is no intimating what further surprises in the way of speedy alteration and adaptation are in store for the Axis. Revised opinions of the Truman Committee, the published findings of the Harter Subcommittee on Aviation, and the exhaustive survey and report of the Office of War Information are all reassuring as to the general superiority of American airplanes. Even in the list of 12 "best" planes drawn up by Peter Masefield of *The Aeroplane* and the *London Sunday Times*, American types score 7 out of 12, and many of the ablest authorities, in reviewing his lists, insisted that in the heavy-bomber class the American *Fortress* had the edge on the British *Lancaster*, and in the medium-bomber category either the American *Mitchell* or *Martian* was superior to the relatively untried German *Dornier* 217E-2. It is also doubtful if the Italian *Savoia Marchetti* 84 land-based torpedo bomber is as fast, powerful, or anywhere nearly as heavily armed as the American B-26 *Martian* (called *Marauder* by the British), used successfully as a torpedo-bomber in the Midway and Aleutians engagements. If these three strongly supported substitutions in the original list were made, it would give American aircraft 10 places out of 12, 5 for Navy and 5 for Army Air Force types. This would be even better than the carefully considered declaration of the O.W.I. report which stated, "The best the public can expect, and the best it will get, is that on the average the equipment of the Allied air forces shall be superior to the equipment of the enemy."

The Peter Masefield list is of course in no way official and represents merely the opinion of one expert among many. As such, however, it does provide a basis for discussion, and the list is submitted with unofficial comments and additional suggestions which may be of interest. His selections are good on the whole, in that all the airplanes mentioned are first class and worthy of inclusion in any such round-up. However, the fact that two of the Naval planes (*Helldiver* and *Corsair*) have not yet been proved in combat is a weakness, despite the undeniable superiority of these models in service tests. Also the classification is a bit narrow, some differentiation in types of land-based fighter planes being necessary, and room should be made for the very important light- or attack-bomber class. The suggested list provides for these additional types and nominates a few additional models for consideration. No unproved models are given as first choice, although a revision of such a list some months hence would probably bring some of them to the top. Masefield's original 12 are all included, though in some cases, for one reason or another, as second choice. It is admittedly easier to submit more than one choice for a given classification than to come down off the fence, but as some airplanes are "best" for certain purposes, even within the same general classification, it is believed that a more accurate and comprehensive picture is thus provided.

New models coming along may enable our American Air Forces to retain this better than average superiority, both in quality and quantity. Reports of a new German high-altitude bomber and at least one fighter plane, with pressurized cabin, provide sharp reminders that no country has a corner on aeronautical research. We have to keep on our toes, and boldness and imagination are required to meet possible threats by air. When air supremacy is achieved, ultimate victory is assured, and with it the hope of a more stabilized and co-operative world order. This has its challenge to America both in the field of an international air policing setup, and in globe-encompassing air passenger and cargo transportation as an effective aid in reconstructing a war-weary world. Wings of Power will have to function for a long time, but this will not necessarily interfere with Wings of Friendship.

THE WORLD'S "BEST" AIRPLANES?

Class	Masefield	Author's Suggestions
HEAVY BOMBER	Avro *Lancaster*	Boeing *Fortress* (B-17F); Consolidated *Liberator* (B-24E); *Lancaster*
MEDIUM BOMBER	*Dornier* 217 E-2	North American *Mitchell* (B-25); Martin *Martian* (B-26); *Dornier* 217 E-2[a]
.....	.....	LIGHT BOMBER: Douglas *Havoc* (A-20)
LAND-BASED TORPEDO BOMBER	*Savoia-Marchetti* 84	Martin *Martian* (B-26); S-M 84[a]
NAVAL TORPEDO BOMBER	Grumman *Avenger*	*Avenger*
NAVAL DIVE BOMBER	Curtiss *Helldiver II*	Douglas *Dauntless* (SBD); *Helldiver* (SB2C—Army A-25)[b]
NAVAL PATROL BOMBER	Consolidated *Coronado*	*Coronado* (PB2Y)
ARMY SCOUT	North American *Mustang*	*Mustang* (P-51)
SINGLE-SEATER FIGHTER	Supermarine *Spitfire*	INTERCEPTOR: *Spitfire IX;* Focke-Wulf 290;[a] Hawker *Typhoon;*[a] Lockheed *Lightning* (P-38G)
.....	.....	HIGH-ALTITUDE FIGHTER: *Messerschmitt* 109G;[a] Republic *Thunderbolt* (P-47D)[b]
.....	.....	ALL-PURPOSE FIGHTER: Hawker *Hurricane II;* Curtiss *Warhawk* (P-40F)
NAVAL FIGHTER	Vought-Sikorsky *Corsair*	Grumman *Wildcat* (F4F-4); *Corsair* (F4U-1)[b]
NIGHT FIGHTER	Bristol *Beaufighter*	*Beaufighter II*, Douglas *Havoc* (DB7-B, P-70)
TRANSPORT SEAPLANE	Boeing *Clipper*	*Clipper* (314A)
TRANSPORT LANDPLANE	Douglas *Skymaster*	Curtiss *Commando* (C-46); *Skymaster* (C-54)

[a] Newly in service.
[b] In production and operational service, not yet in combat (12-1-42).

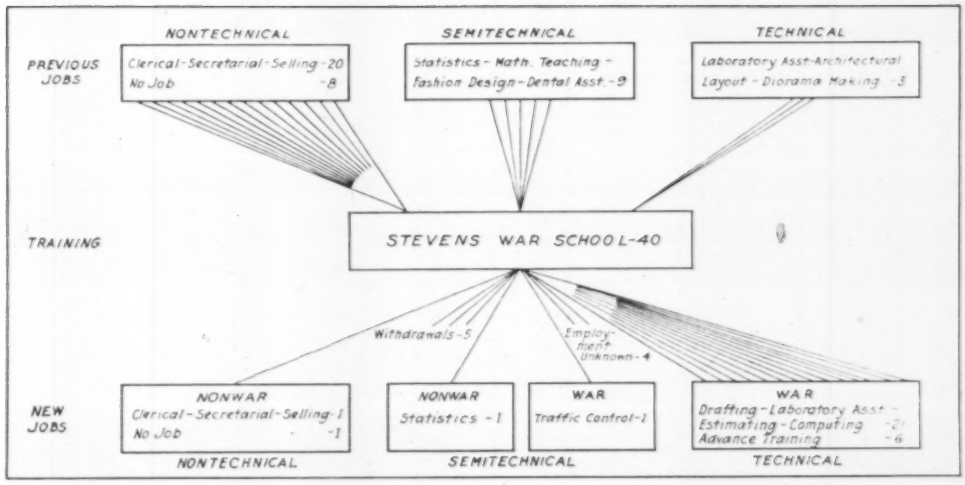


FIG. 1 ROUTING OF WOMEN FROM COMMERCIAL TO WAR-PRODUCTION JOBS

What Can Be Done to Train WOMEN *for* JOBS *in* ENGINEERING[1]

By R. H. BAKER and MARY L. REIMOLD

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ON February 2, 1942, less than two months after Pearl Harbor, thirteen young women were admitted, in an entering class of men students, to the Stevens War Industries Training School. The admission of these women to the emergency courses, sponsored by the United States Office of Education, marked the first time in this college's history that young women had entered any course of undergraduate level. The highly satisfactory performance of these girls paved the way for enrollment of two succeeding and larger groups of girls into the same course. For the duration of the present conflict, the War Industries School expects to enroll as many more qualified women candidates for training as its facilities can accommodate and as its recruiting methods can supply.

The industrial openings for which these candidates were being trained did not exist at the time of their enrollment. Scarcely an industry in the area of the school was using women or girls in engineering work. That women would meet much prejudice and even opposition in the conservative departments of these industries was early recognized by the school. Girls of high quality would be needed to meet these challenges.

To help steer the school through the inevitable difficulties of its undertaking, an advisory committee was formed including outstanding women from colleges, industry, and government. On the advice of this group and several personnel officers from industry, the two chief criteria for candidates were: (1) That they be scholastically able to handle the engineering training; and (2) that they be mature in point of view. A full-time 12-week course was planned for women and girls who were college graduates with majors in science or mathematics. The course was publicized by circularization of the colleges, releases to newspapers, and a few radio broadcasts. Seventy-three women sent in applications, 67 were interviewed, 29 were tested for admission, and only 13 finally enrolled.

INTRODUCTION TO ENGINEERING

The full-time course, developed by Stevens, contained three subjects as follows, requiring twelve 44-hour weeks for completion: (1) Engineering Problems; (2) Engineering Drawing; (3) Machine-Shop Practice. Prerequisites for the course were merely that an applicant be a high-school graduate and have satisfactorily completed $1^1/_2$ years of algebra and 1 year of plane geometry. In addition, satisfactory standing on the school's aptitude tests is now required.

Besides this introductory course, two more advanced courses were offered. The first for those who had satisfactorily completed the original 12 weeks, and the second for those who had completed 24 weeks. The intermediate course in this group was entitled "Elementary Machine Design," and the advanced course, "Engineering Orientation."

OPENINGS FOR WOMEN IN TECHNICAL WORK

The Stevens War School had found that it was able to provide for men the technical bridge between a high-school or nonscientific college background and certain semitechnical jobs. The men inducted into the early section of the course had performed very satisfactorily on this condensed work of college-freshman level and had been placed in such jobs as drafting, engine testing, inspection, tool design, production planning, etc., at $20 to $35 a week. Shortly after the first course for women had been started, it was thought advisable to conduct a survey among local industries where male students had been

[1] Abstract of paper contributed by the Management Division and presented at the Fall Meeting, Rochester, N. Y., October 12–14, 1942, of The American Society of Mechanical Engineers.

accepted to determine how receptive these companies would be to the idea of using women.

A preliminary survey of 11 concerns revealed that in all but one case women were either being considered or were being used for various kinds of technical jobs. The companies covered in this research included an aircraft-engine concern, two electrical-equipment concerns, two communications concerns, two heavy- and one light-equipment plants, one instrument company, and one concern manufacturing compressed gas.

Interviews with personnel managers or other executives were conducted to obtain information on (1) the minimum immediate need for women for technical work; (2) the different types of work they would be used for; and (3) what would be considered satisfactory training for this work.

The employees of the 11 firms interviewed totaled approximately 190,000 persons. The estimates of their minimum immediate needs (March and April, 1942) ran to 800 additional technically trained women. Three large companies accounted for 720 of these openings, with the other seven smaller plants planning to take on from 5 to 30 women each.

Among the probable openings for women in engineering departments, there were eight classifications which consistently recurred: (1) drafting; (2) computing; (3) assistants to engineers; (4) clerical engineering work; (5) laboratory work; (6) precision inspection; (7) experimental engine testing; (8) supervisory work in production.

Educational requirements varied from high-school to college graduation plus technical training for the various positions.

JOBS OBTAINED BY FIRST GROUP OF WOMEN

At the end of 3 months of training, six women decided to go on for more study, and six left the school to get jobs, one having dropped out. The first practical use of the survey was in the placement of those women who decided to leave after the first 3 months of training. The academic records of the six students to be placed were reviewed and these students interviewed for job preferences. Several companies, in addition to the 11 originally considered, had inquired about women (particularly for drafting) and each student was referred to three or more concerns where there were openings of the sort she wanted.

The six students found jobs as follows: One trainee in drafting, one in production planning, one in estimating, one in computing, and two in laboratory work. Starting salaries ranged from $26 to $35 a week.

In a recent follow-up of these six women, it was found that two students used their shop and drafting background, and one used all three parts of the course directly, Shop, Drafting, and Engineering Problems. Another woman uses only Engineering Problems, and the last two do not use directly any of the material learned in the course, beyond indirectly benefiting by engineering applications of their theoretical mathematical background.

Whether or not the students have made direct use of the War School course in their present work, they and war production have derived one benefit from this attendance at the War School. Whereas some of the most highly trained had been wasting their background in routine and conventional jobs, all of them have now been channeled into fields much more suitable to them on the basis of their past education and, at the same time, much more productive in the war effort. This is graphically illustrated in Fig. 1.

It was found that war industries prefer to provide in-service training for mathematically educated college women they are able to obtain. This fact, plus the experience at Stevens that such training as was offered was of little advantage to these students, led the War School to consider women in lower educational brackets for succeeding courses.

The first group of thirteen women had been in class for less than a month and were proving that they could hold their own in school work, when it was decided to enroll a new section of students. The course started on March 28, 1942, with 27 female candidates having suitable entrance qualifications, and 15 acceptable men. A third class, enrolled in June, consisted of 30 women and 42 men.

SECOND-GROUP PLACEMENTS

Placements for the second group ranged from assistant supervisor in a computing department of nine persons to junior draftsman on electrical equipment. Included were jobs in which the women might be called "engineering assistants," whose functions are primarily drafting, computing, estimating, and the testing of model airplanes, or a combination of several of these jobs. One woman, a college economics major, who had been in theatrical activities, works for a government agency, compiling figures and writing reports on a state-wide survey of machine tools. In placing high-school students and college students, the War School found that the former obtained more routine and less responsible positions than the latter. But regardless of background, all the women of the second sec-

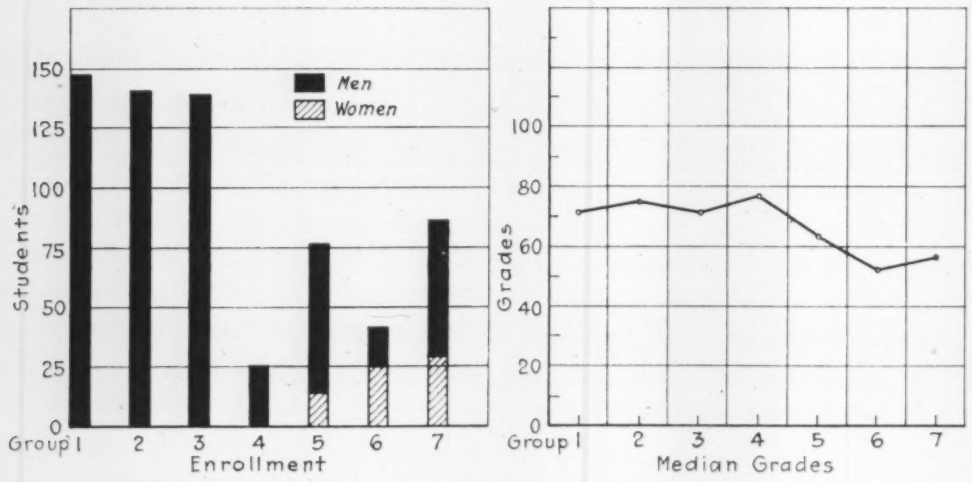

FIG. 2 TREND IN ENROLLMENT AND MEDIAN GRADES IN ENGINEERING PROBLEMS FOR SUCCESSIVE GROUPS OF WAR SCHOOL STUDENTS: JANUARY, 1941–JUNE, 1942

tion have been shifted from nontechnical, nonwar jobs, or no jobs, into positions in war industries.

At present, the most crucial problem in the training of women for engineering jobs is to obtain qualified candidates to train. It is believed that there are three important reasons for the recruiting difficulties which technical war schools, such as Stevens are experiencing. These are (1) the majority of women lack any real interest in engineering, (2) many women lack the previous training to go immediately into engineering study, and (3) our entrance tests show that, while some women score as high as men, women generally are low in both the technical knowledge and the space sense basic to engineering.

To give an over-all picture of the recruiting problem, it appears from experience at the Steven's War Industries School and in psychological testing that even among those who meet the entrance requirements, perhaps 5 out of 10 men possess suitable aptitudes and interest for engineering training, whereas only 1 or 2 out of 10 women possess those qualities.

Generally speaking, the training of both men and women has progressed satisfactorily. There is already a slight decline in the quality of available applicants because of Selective Service and because of immediate employment open to all who possess above-average qualifications, Fig. 2. However, the school intends to train as many qualified candidates as can be formed into a homogeneous group in each succeeding section.

CONCLUSIONS

As a conclusion to this study, we must emphasize two aspects of the problem of training women for engineering jobs:

1 The majority of women approach engineering with a minimum of aptitude and preliminary training in requisite subjects. These deficiencies must be recognized, therefore, in planning the technical training of women. Secondary schools could be of assistance here if they would direct more girls into mathematics and science.

2 The training of women must be undertaken on a considerable scale. We have noted that the number of women already equipped for engineering work on any level is negligible. We have demonstrated that women can be trained in a relatively short period to handle capably a number of engineering jobs of varying degrees of technicality.

It is of paramount importance to arouse the young women of America to a sense of their responsibility in the war industries as well as in the auxiliaries to the armed services, or in volunteer work. This may be done in one or all of three ways: (1) By the establishment of regional War Work Information Centers where direction to training and jobs is given; (2) through the greater publicizing by industry of its needs for technically trained women; (3) through the national registration of women for war work. In any event, women must be attracted or recruited into training for the war industries.

WOMEN TAKE PART IN VITAL WAR PRODUCTION

(Final inspection on pistons in Buick aircraft-engine production. There are eight different inspection stations in this group.)

WOMEN *in* ENGINEERING

By LILLIAN M. GILBRETH

PRESIDENT, GILBRETH, INC., MONTCLAIR, N. J.

THE past, present, and future of women in engineering furnishes a problem which is of general interest today when war needs not only offer opportunities to women in this field but demand more engineering women than are available.

It may serve a useful purpose to apply the engineering method of attack to this problem in order to present it most clearly. This consists in stating the problem as simply and explicitly as possible, asking the key questions: "Is it necessary?" "If not, why not; if so, why?" and then applying the criteria—what, who, where, when, and how?

The result of such a method of approach may not be the answer to the problem but it will, at least, supply the first stage of the solution which is to know exactly what the problem is. It is a difficult job to apply this method of attack because, as will be shown, there are many emotional factors involved and these are not easy to discover, to state, or to measure. Any attempt to do this does, however, show that disregard of the emotional factors precludes an adequate solution of the problem no matter how scientific the techniques of measurement in other areas may be. It also makes clear the need for more adequate techniques of measurement in the emotional area, and this may lead to their development.

PERSONNEL AND OPERATING PHASES OF WOMEN IN ENGINEERING

The problem of women in engineering involves both the personnel side and the operating side. To use the accepted terms of industry: Should women become engineers because personnel techniques indicate that they can prove successful both by their own standards of success, those of the groups in which they work, and those of the public? Or, should they remain out of engineering because the techniques demonstrate they have not attained and probably could not attain success? Do the judgments of personnel authorities, who have supplemented their fine training with adequate experience, go to show that women are successful in engineering, or do they not? Have adequate techniques for selection, placement, transfer, promotion, and release been developed and applied so that we are convinced the findings of the experts are valid, or are there still imperfections in the techniques, which mean that any pronouncements can be and perhaps should be challenged?

WHY DO WOMEN WISH TO BECOME ENGINEERS?

It might be useful to list as part of the data in the personnel area some of the reasons why women want to be engineers:

1 To satisfy the creative impulse to make a contribution in this area.

2 To carry on engineering work with or for father, mother, brother, uncle, husband, son, daughter, grandchildren.

3 To do a war or other service either directly or by relieving others to do more highly skilled work.

4 To experience the thrills the life of an engineer may bring.

5 To avoid other activity which is disliked.

6 To establish a satisfactory "career" which will give prestige and, perhaps, in some instances furnish an acceptable explanation why one has not married.

7 To be in the area where the state of "career and marriage" is more acceptable than in some other areas.

8 To insure meeting and working with men as co-workers or competitors.

9 To acquire the discipline of science, mastery of techniques, and the security of laws, formulas, and devices.

10 To insure a job. The war has proved the value of a technical and scientific training.

11 To acquire a method of attack on all types of problems. (This is especially true in the field of scientific management.)

12 To develop and use skills. This appeals to the dexterous, "fingerwise," "I love to use my hands," type.

13 To be in a developing profession.

14 To gather material for writing, as author, editor, free-lance writer, etc.

15 To be on a protected job. (Industrial legislation for women provides this.)

16 To be on a safe job. (Safety and industrial-health work insure this.)

17 To be on an "all one's life" job, as compared to jobs where youth is essential.

18 To be a woman pioneer.

19 To be able to furnish the "woman's angle," as is being done in the housing field, automobile field, equipment field, etc.

20 To gain power over people, directly, or through money, prestige, etc.

This incomplete list is based upon interviews with women who have become engineers, or with girls who are thinking of engineering as a profession, as well as upon books, magazines, articles, etc. in this field, which are distributed in libraries under a great variety of headings having to do with "Careers for Women," "Biography," "Psychology," "Industrial Problems," etc.

It would seem evident that women are seeking to get and to give a great variety of satisfactions. It would be interesting to see how many of these are identical to, or similar to, satisfactions of men. It is important to note that while personnel procedures, industrial psychology, and other branches of psychology furnish means of analyzing these desires and the urges back of them, the materials and techniques, as yet, are admittedly inadequate. By and large, however, it would seem as if there were sufficient importance to this personnel side of our problem to justify continued, intensive, and expanding study.

WAR WORK CAN BE DONE BY WOMEN

The second area of the problem concerns the operating side. Is there work in the engineering field required to be done, and can adequately trained women do this work satisfactorily?

Records going back prior to the first World War and expanding during that war prove that women did all types of engineering work which they were allowed to attempt and, in many cases, with far less training than had been thought necessary. This is a much more complicated statement than it may seem, for it involves problems of securing opportunities, securing training, and securing adequate evaluation, which are very complicated. Both the exigencies and the motivation of war are apt to be so much greater than those of peace that it is very difficult to utilize war experience in times of peace.

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We must add to this the fact that postwar situations, economically and socially, are apt to be such that women return from work outside the home to the home, both because they give up the outside jobs to men and because their home and family duties become, in some cases at least, more demanding. We have, however, especially in England, a wealth of illustration concerning women who remained in the engineering field and have continuously achieved more or less outstanding success according to the nature of the job and their own capacities. This material had not been sufficiently analyzed and evaluated to open operating jobs in the engineering field to women in this country, before this present war and the defense needs which preceded it started.

There is no doubt that at the present moment women engineers are not only accepted, but increasingly demanded, on operating jobs. Even those most optimistic about the results have been amazed at the rapidity with which women with engineering training have been placed. The number of openings available increase with great rapidity and adjustments to jobs have been made readily and have facilitated operating efficiency.

ARE WOMEN NECESSARY IN ENGINEERING?

To turn now to the question: "Is it necessary that women go into engineering?" One may say tentatively, at least, in peacetime and during depressions, "No;" during expansions, "Probably;" in war, "Yes." Does this mean that the problem is that women go into engineering "to replace men?" If so, we have a far more difficult problem than if we state the need as "to do work needing to be done, which has been done by men in such a way as they can best do it." The first problem implies making over women; the second problem implies making over jobs. The first of these would mean less responsibility to make changes placed upon the operating group, but a terrific responsibility put upon the personnel group. The second problem would mean divided responsibilities between both groups, in that the personnel group would try to demand as little as possible of the operating group, while the operating group would co-operate in making such changes as it could, and thus simplify the work of the personnel group. This, of course, implies (1) job analyses and constant changes made by the operating group, and (2) personality analyses, in the light of these, made by the personnel group, with specific standardization of quality and quantity of product desired.

As to the "what?" Are there any areas of engineering work women cannot do, should not do, do not so well as men, do as well as men, do better than men?

"Who" should be chosen?

1 What tests have we to select women?
2 What is the best training?
   (*a*) For the job?
   (*b*) On the job?
   (*c*) For transfer or promotion?
3 What provision do we make for promotion? For release? For leave, including maternity leave? For security, including pension, insurance, etc.?
4 Must we make any differentiation between men and women in the various areas of the "who?"

"Where?" Are laws for the protection of women inadequate, adequate, or overprotective? Have hazards, as lifting and carrying of weights, health and safety, the work place itself—getting to and from it, housing, etc., been sufficiently considered?

"When?"—including both "time when" and "time how long."

1 Have age, minimum and maximum, been considered?
2 Daywork and nightwork?
3 Number of years, number of days in a year, hours in the day, etc.?
4 Should the aim be a smaller number of work-years at top capacity or a longer number of work-years at lower capacity?
5 How much time is needed for rest, recreation, leisure, recuperation?
6 How should time be allocated to job, family, society, self?

"How?" Is methods study adequate? Have changes in methods which might make women better workers and happier people been thought through? Is not this area especially appropriate for women and does it not involve a critical situation which often spells success or failure for women on a job? Are work standards so explicit and adequate that health and safety problems, such as flying hair, fatigue, clothing, etc., cannot arise?

It is to be noted that this material has been put in the form of questions rather than of statements. This is partly because answers to these questions in many cases are not available, and also because it is essential that these questions be constantly asked concerning women on engineering jobs, if we are ever to get an adequate answer to the fundamental problem which we are trying to state. It is evident that most of these questions must be asked of men on similar jobs. In fact, it becomes increasingly evident that we have paid too much attention to sex differences and too little attention to the difference between efficiency and inefficiency.

HANDICAPS FACED BY WOMEN IN ENGINEERING CAREERS

There are certain handicaps which women in engineering have faced. It might be useful to list some of these here.

1 Attitudes of family, friends, schools toward women going into engineering.
2 Inadequate selection. Wrong women sometimes get in; right ones sometimes stay out. Even the preparatory schools often discourage promising candidates for engineering.
3 Inadequate training in the preparatory schools, in colleges, etc. Even those who admit and give equal opportunities may not have adequate courses. This is especially true in the field of management, as yet the neglected area in the engineering field.
4 Prejudices of employers, technical societies, public.
5 Inadequate "in-service" training.
6 Inadequate promotion.
7 Difficulty of combining marriage with career. This, while less in engineering than in many other areas, still exists.
8 A feeling that men should have first call on all jobs.
9 A feeling that men should have first call on engineering jobs.
10 Unemployment and all hazards that men face.

ADVANTAGES ENJOYED BY WOMEN

Women have certain assets in facing their future in engineering.

1 Women have succeeded in engineering, as a study of British women and women in this country will prove.
2 They are of a good type—serious, hard-working, generous to the younger women going into the profession.
3 They have received the support of fine men who have insisted that they be admitted to the technical societies and given opportunities for training and for work.
4 They have been more fortunate than their British sisters in obtaining membership in the technical societies and are gradually having opportunities to work on committees.

(*Continued on page 859*)

WOMEN *in* SHOPS

Employment Experience of the Montreal Locomotive Works, Limited

By L. L. PARK

SUPERINTENDENT OF WELFARE, AMERICAN LOCOMOTIVE COMPANY, SCHENECTADY, N. Y.

IN THE mid-year, 1941, the Montreal Locomotive Works, Limited, faced a considerable expansion of its working force to provide for an enlarged program in its newly built shop for war production. While the labor situation was not at that time acute in Canada, there were evidences of a growing shortage in man power, and the management of the locomotive plant decided to anticipate that shortage by experimenting with the employment of women in some types of shopwork.

Early in March, 1942, the actual employing of women began. A backlog of applications from young women had been acquired during the preceding months, from which selection was made. No special scouting for recruits had been necessary, as many applicants had been calling at the plant employment office, and the supply of women applicants was then ample and has since continued to exceed the need.

As the early experiments with women proved successful in the shop, the types of work employing women were increased so that, at the present time, approximately 400 young women are employed on 19 different types of work. These may be divided into two groups, one including clerical work, the other mechanical operations.

SYSTEM FOLLOWED

Requirements and Selection. For those engaged in shop clerical work, high-school education is required; for manual duties no educational standards are set, except that all must speak, read, and write English, since all instructions are given in that language. (Many of the women employees are French Canadians.) Physical standards are dependent upon the work involved; height, weight, and strength are demanded according to the needs of the task. All young women employed in the shops are examined by the women nurses in the first-aid room. This is not a medical examination but it is sufficient to satisfy the nurse that the applicant is capable of meeting the requirements of the work involved.

Young women, ages 18 to 30, inclusive, are selected for shopwork. The selection is made by a young woman supervisor, who is a registered nurse, attached to the superintendent's office. When recruits are needed, the supervisor makes requisition on the employment office, the latter sending applicants for interview with the supervisor. Selection is then made by the latter and the applicant is sent to the foreman making the request, who must approve the selection before the applicant is accepted. Those selected are enrolled by the employment office, in the same manner and in the same office as are men employees.

Breaking-In. Following the custom of the plant, all women workers are broken-in on the job. On occasional operations, women break-in in less time than do men on the same work, sometimes reducing the break-in time by one third below that taken for the average man.

Contributed by the Management Division and presented at the Fall Meeting, Rochester, N. Y., October 12–14, 1942, of THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS.

TYPES OF WORK

Originally the women were employed as floor sweepers, electric-truck operators, benchworkers, and operators of light machines. At present the list includes the following:

Crane Operators. These are heavy electric traveling cranes handling all types of load. Women operators must demonstrate their ability to climb readily.

Welding. Electric welding is performed on parts weighing up to 50 lb. This is position welding, performed in a specially screened-in section of the shop. Men are available for lifting the heavier parts being welded.

Turret Lathes. Mostly light work on turret lathes, all tool setting being performed by men.

Drills. All types of drill-press work, except the very heavy work, is performed, the work being loaded and unloaded by jib crane or by men to do the lifting.

Milling Machines. Small work on horizontal millers is included, all tool set-up being handled by the men.

Grinders. Both rough and precision grinding are handled by women on medium-weight and small parts. They produce a good finish and sometimes do neater work than the men.

Vertical Boring Mill. Lighter work on medium-sized machines is handled by the women.

Horizontal Boring Mill. These are the relatively light Borematic machines.

Pipe Assembly. Benchwork in assembling small pipes and fittings is performed, although no pipe installations on finished product is yet included.

Electrical Assembly. The assembling of parts and wiring up electrical panels is one of the jobs in which women excel. Not only is their work neater but their deft fingers often complete the work in less time than do some of the men.

Motor Assembly. Attaching parts to completed gasoline motors and connecting up all wires and rods are jobs performed by the women, except for attaching the clutch. The actual installation of motors is handled by the men.

Bench Filing. Some fitting-up of parts is performed, but mostly this work is the smoothing off of rough edges.

Laboratory. In the metallurgical laboratory, women do routine testing of materials, preparing materials for test, and recording and reporting test data.

Tool-Crib Attendants. Most of the tool cribs are attended by women, some of whom have learned to sharpen tools.

Inspection. Much of the intermediate inspection between the machines and storage is performed by women, who acquire excellent judgment in passing or rejecting parts.

Storeroom Clerks. In storing parts between machining and assembly, women function effectively in sorting, locating storage space, distributing and routing materials.

Production Clerks. In the shops where production records are kept, young women have proved very satisfactory in all phases of the work.

Truck Operators. As already mentioned, women truck operators move material efficiently. These are electric lift trucks

which handle trays loaded with material, so that the women do not handle the material itself.

Sweepers. Women cleaners in the shops do a better job than the type of man who is willing to do this work, so that shops are kept clean.

In all of these types of work the result of employing women has been entirely satisfactory. The extent to which women are to be employed is determined by the superintendent, in consultation with the foremen. Only those types of work are considered which it is felt women can perform satisfactorily. Much of the success of the program depends upon the selection of the right type of woman for each job, although no special tests are used for determining fitness, other than the test of the job itself. If the first assignment proves unsatisfactory, a transfer is made, based on the experience of the first job.

SHOP CONDITIONS FOR WOMEN

Special Provisions. To equip the women for their work in the shops, each new employee is fitted with a suit of union overalls. These are furnished free of charge and are laundered each week, also without charge to the employee. She is required to purchase a pair of safety shoes (steel-toe-cap shoes), which may be purchased at the employment office at cost, on a payroll-deduction plan. The problem of head caps has not been entirely solved. For welders, a cloth cap is used which is very satisfactory, except in hot weather. For other jobs, a light turban has been used, though difficulty is encountered in getting the girls to cover all of their hair. Other types of cap are being given consideration.

A rest room and locker room combined is provided, a matron being in charge at all times. No special rest periods (other than refreshment periods) are planned, although reasonable use of the rest room is permitted. The lunch hour for women is arranged a half hour earlier than that of the men, so that the shop cafeteria may be used by the women by themselves.

Accident Tendency. The question of safety among women workers is an important consideration. Because of the newness of their shop experiences, most women are careful in handling their work. Each new employee is given a copy of the plant safety-rules book, and the more important rules are explained in detail particularly during the breaking-in period.

In lost-time injuries, the women's frequency rate is 80 per cent of that of the men in the same shop, and in severity, the women's rate is 50 per cent of that of the men.

First aid is provided in the same shop hospital as that serving the men in the same shop, and there has been less difficulty in getting the women to report their small cuts and scratches than is true of the men. As a rule, women are less clumsy than men and have less trouble in keeping their hands and feet out of dangerous places. For this reason the list of trivial injuries is somewhat lower among the women.

Hours of Work. The war-production shop operates on a three-shift basis, and it is understood that all women accepting employment do so with the proviso that nightwork may be required. All new employees are broken-in on the day or first shift but are assigned to any of the three shifts as found necessary. There has been little difficulty in getting women to work nights, coming or going at 11:30 p.m., when the shifts change. The city trolley cars pass the shop door and provide adequate transfer service for night travel to any part of the city or suburbs.

GENERAL CONSIDERATIONS

As already noted, the employment of women in this plant has functioned with remarkable ease and with general satisfaction. Men and women are working side by side on many jobs with no disadvantage. The discipline is excellent and there is no fooling between men and women workers. The women take their work seriously, are steady workers, and, when once accustomed to their work, need little more supervision than do men. Labor turnover among women employees is relatively low, seldom reaching $1^1/_2$ per cent per month. Any problems arising from the work of the women (apart from mechanical or production problems) clear through the supervisor in the superintendent's office, and transfers are arranged through that office. Both the manager and superintendent, as well as the foremen, are pleased with the results achieved during the period in which this program has been in progress. It has passed the experimental stage and has become a regular part of the war program of the plant. No effort has been made to give a "feminine atmosphere" to the shop, and the women workers seem to appreciate the fact that they are working on a basis paralleling that of men workers.

It should be noted that men have not been displaced by women, except where the former have been advanced to better jobs. Since the shop has been developing a growing schedule of production, the need for new workers has made possible the program described. Another feature favorable to the program is that all women shop employees are located under one roof, so that there are no cases of isolated employment or of special facilities being needed in small shops.

Preparatory Schooling. As has already been stated, employment of women has been based upon the selection of recruits from among applicants appearing at the employment office, regardless of previous schooling as a preparation for shop-work. This does not indicate any lack of appreciation of the value of such training but merely that the efforts of the City of Montreal in that direction have not as yet reached the plant, which lies some distance outside of the city. The value of preliminary schooling lies chiefly in discovering mechanical aptitudes, rather than in preventing the necessity of breaking-in on the job. Because of the variety of work being undertaken by the women in the shops of this company, some training on the job is essential in every case, and the plant has been fortunate in the small number of rejections found necessary in the training period.

Nevertheless, there is a distinct value in having the schools of the community carry on a sifting process to direct into proper channels those whose talents have special direction and to give some indication of fitness for the work sought. Such schooling is of value to the worker and to the prospective employer.

Women in Engineering

(Continued from page 857)

5 They have profited by the increasing emphasis which engineering gives to management and through this to the findings of industrial psychology.

6 They have excellent opportunities in this war.

7 As the last war brought political equality of women, this war seems likely to bring economic equality, which will be a tremendous asset for women in engineering as in other fields.

8 The application of the scientific method in general and the application of that method to the problem of women in engineering in particular should be a tremendous asset.

At the present time what is needed on the personnel side is a friendly co-operative attitude toward women who are engineers and those who desire to become engineers. On the operating side, what is needed is a careful study of jobs in order to place women where they can do their best work, and in order to make adjustments where these seem justified.

CANADA *at* WAR

By THE HON. HUMPHREY MITCHELL

CANADIAN MINISTER OF LABOR, OTTAWA, ONTARIO, CANADA

I AM very happy to be here this evening and I thank you for the invitation to speak to this distinguished Society.

I bring greetings from your neighbor across the way joined with you in common cause to put an end forever to the greatest menace that has confronted mankind since the dawn of history.

Although we have just begun to fight we can foresee the utter destruction of a would-be world tyranny, thanks to your and our young men and those of the United Nations who offer their lives daily in all the elements so that freedom shall not perish from the earth.

Remembering them and inspired by them we shall thank heaven if we emerge from this war stripped of all we have but clothed in the garments of freedom and with our eyes fixed upon the dawn of a new day. Defeat would mean the slavery and despair of the dark ages.

Perhaps this terrible war will teach us that our way of life will not persist without effort on our part. We must have the will and the courage to ensure its preservation and the broadening of its freedoms.

Many mighty nations whose civilization has flowered and then decayed are examples to us of what the lack of this human driving force means.

May I add this point as a tribute to your great President who, in these very troublesome times, has given leadership and encouragement to the people not only of your country but also of all the United Nations.

I have a vivid recollection of the time of the fall of France, when the British people had little but their bare fists with which to withhold the enemy, and you yourself hadn't much more.

The decision of your President to send what equipment you had in order to assist the British in fighting what at that time appeared to be the closing stages of the battle of freedom will go down on the pages of history as one of the most unselfish acts of any nation.

THE CANADIAN FIGHTING FORCES

In Canada we have fewer than twelve million people—but I think we have built up a great war machine.

We have many thousands of sailors, soldiers, and airmen over there in the Island Fortress of Britain. Canadians fly to battle over Russia, in Libya, and there is hardly a night they do not sweep over enemy territory in smashing bombing raids.

Three years ago Canada had an army of about 4000 men. Now we have 350,000 men—soldier-citizens, men who were farmers, clerks, lawyers, workers. That is our active army. We lost many at Hong Kong and Dieppe.

We have in the Reserve Army manning the home defenses another 120,000 men.

Before this war began we had a Navy of 1800 men and 15 ships, and I am proud—as an old Royal Navy man—to tell you that today we have more than 41,000 men and nearly 500 ships of all kinds in our Navy.

Canadian sailors and ships are serving with the United States Navy and the Royal Navy in the western Atlantic, fighting the greatest U-boat campaign of the war in order to maintain the life line of civilization.

It is a trinity of courageous men—fighting for you and me, fighting to save all we hold dear.

The vision of those who conceived the great commonwealth air-training plan in Canada has been vindicated. Many of your best airmen came up to help us when it began. They gave us an important lift over the stile.

When this war began there were 4000 men in the Royal Canadian Air Force. We have 125,000 now.

Britain, Australia, New Zealand, and Canada were the original partners in the plan.

Men who were trained in Canada are engaged on every battle front. They are writing a history of daring in the air over Britain, the European Continent, the Middle and Far East. Our boys have joined with yours in far-off Alaska.

TRANSITION TO A WAR ECONOMY

Our transition from a peace to a war economy has been remarkable. Canada did not take long to shift gears from the manufacture of refrigerators, cars, sewing machines, and radios to the production of guns, tanks, aircraft, explosives, chemicals, and ammunition.

Great war plants have been erected across Canada. We are making things we never made before—in fact, secret precision devices we never thought we could make.

As the Minister of Labor it is my duty to see that industrial relations are harmonious—that production of war materials shall not be interrupted. We have had little industrial trouble. Our workers, too, are imbued with the spirit of sacrifice.

Prior to the outbreak of the war Canada was best described as the breadbasket of the Empire. Now Canada is also an arsenal of the Empire.

Since 1939 Canadian war plants, most of them built in record time, have handled orders for five billion dollars of munitions and materials of war.

We are still the breadbasket. We are glad to send all the food we can to Britain and Russia. We must sustain their men, women, and children. They are on the front line.

Since the outbreak of war we have sent them almost one and a half billion pounds of bacon, nearly three hundred million pounds of cheese, ninety-four million cans of evaporated milk, and close to seventy million dozens of eggs.

Canada is this year making an outright gift of one billion dollars to Britain. We have given further aid to the Motherland by repatriation of more than one and one-half billion dollars of securities and loans.

This fiscal year we shall spend three billion two hundred million dollars for war. That is $278 per capita, twice the entire cost of the first Great War.

We are heavily taxed and we are finding there are many things we must do without. We do not mind. We shall do without much more as the war goes on. What matters but victory!

WAR AGAINST INFLATION

We were the first of the democratic countries in this war to gird ourselves for the battle of inflation.

We were afraid that even with victory in the field we might

An address delivered at the Fall Meeting, Rochester, N. Y., Oct. 13, 1942, of The American Society of Mechanical Engineers.

suffer defeat on the economic front. So in the fall of 1941 we pegged prices of the necessities of life and we stabilized wages.

We introduced our cost-of-living bonus plan to enable workers to meet the increased cost of living.

You will recall that from 1914 to 1920, during the first World War and the two difficult years that followed, prices in Canada rose 98 per cent. Wages lagged behind.

The benefit of our present plan will interest you. From July, 1914, to September, 1917, the cost-of-living index in Canada rose from 100 to 135.3. During the corresponding period in this war the rise was from 100 in August, 1939, to 116.5 in September, 1942.

Now let us look at the picture while our control plan was in operation. From October, 1941, to September, 1942, the index rose from 114.6 to 116.5—less than two points.

From October, 1916, the corresponding date, to September, 1917, the index increased from 116.1 to 135.3—a rise of 19.2 points.

It is apparent, therefore, that during a little more than three years in the last war the cost-of-living index rose more than twice as much as during the corresponding period in the present war.

In the last eleven months, while wage control and price regulations have been in effect, the cost-of-living index has risen only one tenth as much as it did during the corresponding eleven months' period of the last war.

Even now the cost-of-living index number is at a slightly lower level than it was during 1918.

Inflation means chaos. Cost-of-living bonuses protect the workers but what about the hundreds of thousands of persons in Canada on fixed incomes, the millions of such persons in the United States?

What about pensioners, retired farmers, and others living on savings, on the value of insurance policies? Inflation would bring misery to them.

Inflation would break public morale. It would be a "Panzer" attack against the home front.

CONTROL OF MAN POWER IN CANADA

On December first next the Ministry of Labor will assume complete control of man and woman power in Canada.

A program of national selective service has been developed in the Department of Labor for war and other essential industries. On December first the Minister of Labor will be responsible for the calling up of men for the armed forces.

We are rapidly taking more complete control of our man power. Regulations are now in existence which govern the movement of workers from job to job.

We realize the importance of farming and have provided for indefinite postponement of the military call to bonafide farmers. This means they are literally frozen at farm work.

We have made it illegal for a person to leave a job without giving seven days' notice—illegal for an employer to release an employee without seven days' notice except for serious misconduct.

Those who give notice to leave are urged to stay on if the jobs are in war production. If not they are assigned to other war work. Without a permit no one may take a nonessential job today.

Our ordinary man-power resources are completely absorbed. The needs or our armed forces cannot be denied. We are going to limit more and more of our nonessential production, reduce nonessential business, and divert men and women to essential war work. We have about 150,000 women in war industries now. We shall double this figure in the next six months.

And I should add here we have many thousands of women and girls in our uniformed auxiliaries to the Army, Air Force, and Navy.

In company with Miss Frances Perkins, your able Secretary of Labor, I recently visited a great plant in Canada, the largest small-arms plant in the world.

That plant has 14,000 employees of whom 7000 are women and girls; one used to see them behind counters in department stores and offices. Many of them never worked before.

Now they are making guns and shells and say they have never done anything they liked as well for they are helping their fathers, brothers, and sweethearts fighting for Canada and freedom.

WARTIME BUREAU OF TECHNICAL PERSONNEL

We have had magnificent support in our war effort from the professional engineers.

An important branch of the Department of Labor is the Wartime Bureau of Technical Personnel. This Bureau sprang from the co-operation of the National Engineering and Science Organizations with the Department.

More than 25,000 engineers, architects, and scientists have registered with the Bureau. The form of registration has enabled all to be classified as to their particular skills.

Large numbers of engineers, chemists, scientists, and other technical personnel have been *directed* to other activities more essential to the war effort.

The Bureau performs an advisory function in giving counsel to individuals, companies, and branches of the Government on the relation of technical personnel to the war effort. Close contact is maintained with the various technical branches of the armed services.

TECHNICAL EDUCATION IN WARTIME

To accelerate the graduation of doctors and dentists the Universities agreed to shorten summer vacation from four or five months to as many weeks and thus graduate professional personnel in five calendar years instead of six.

The training branch of the Department of Labor provides a grant to the Universities to meet the additional costs of these accelerated courses.

The Department of National Defense enlists at the beginning of their second last college year all medical and dental students who are physically fit and willing to enlist. They are put on Army pay and allowances and directed to continue their course.

The decision was made not to accelerate the courses for engineers, as practical experience gained in industry during the long summer vacation was considered an essential part of their training.

The Wartime Bureau of Technical Personnel, however, undertook to arrange summer employment along the line of their training for all engineering students.

The greatest obstacle to maintaining or increasing the enrollment of students in essential courses was their inability to finance the cost, particularly in medicine and dentistry, where the accelerated courses prohibited supplementary earnings through summer employment.

The training branch of the Department of Labor obtained the co-operation of the provincial governments in establishing a fund which is available to students in specified years and faculties either as a grant or as a loan or as a combination of both.

The students are selected by committees in each province representing the universities, provincial departments of education, and the National Selective Service and Training Branches of the Department of Labor.

All students assisted in any way sign an agreement that on completion of their courses they will make their services availa-

ble to the war effort, where and when required, in the capacity for which they have been trained.

TRAINING OF WORKERS

In addition to this provision to University students the Department of Labor has been carrying on for over two and a half years a war-emergency training program to train workers for war industries and tradesmen for the armed forces.

The provincial governments co-operate fully, and use is made of existing vocational schools as well as training centers especially established for the purpose.

There are about 125 centers operating across the country and in the past two and a half years they have turned out 90,000 workers for industry and 50,000 tradesmen for the three armed services.

In these matters we have had the wholehearted co-operation of our nine provincial governments.

NEED OF CENTRALIZED CONTROL

I would like to emphasize one lesson we have learned in facing up to our man-power problem, that is, the need of centralized control.

The calling-up of men for military service, deferment from military service, and the selection and assignment of men and women to take the places of men in the forces and expand our war effort are aspects of the same problem.

That problem is the allocation and use of our total human resources in the way that will enable us to strike the enemy our hardest blow.

All demands for man and woman power must be met from a single pool. Different agencies cannot be permitted to draw upon the pool regardless of the needs of the other.

If too many men go into the armed services we will not have the weapons for them nor the ships and planes to carry them to the fighting fronts.

It took us some time to grasp this fact but now we know that if our war effort is to be kept in balance a single agency must administer the national man-power policy. As I have indicated that agency in Canada is the Department of Labor.

NATIONAL RESEARCH COUNCIL

We are fortunate in having an outstanding organization in Canada at this time. I speak of the National Research Council.

This Council has served Canada well in the field of aeronautical and other phases of research. There are new wartime laboratories for this and other purposes.

The Council promoted the manufacture of optical glass and now we have a Government corporation producing precise optical parts for military equipment. I was amazed when I visited this plant recently.

We have in Canada a Wartime Invention Board established to deal with suggestions to further Canada's war effort and 10,000 ideas have been submitted since the war began. Some have been really worth while and have been adopted for development either in Canada or in Britain. A close relationship is maintained with the National Inventors' Council in Washington.

CONTRIBUTIONS OF ENGINEERS

The long-accumulated experience in machine-tool design and operation more than anything else was responsible for the record outputs of today. Canadian engineers have made important contributions in this field.

Two of the most notable special machine tools for armament production, entirely designed and built in Canada, are the Modern Number One and Number Two rotary hydraulic profile milling machines which were designed originally for profile milling operations on the Bren light machine-gun components.

These machines utilize the principle of constant hydraulic pressure maintaining a master profile cam in contact with a follower roller.

In 1939 the output of the machine-tool industry in Canada was valued at $500,000; in 1941 at $28,000,000; and for 1942 at $40,000,000. Canada has become practically independent in this field.

PERSONNEL MANAGEMENT

Personnel management is another field which we entered because when our industrial war machine started to roll we were troubled by many irritating stoppages of work due to minor plant disagreements.

We saw the need of more efficient, understanding plant-personnel direction. In co-operation with the universities and with Government aid practical courses in this field have been given this past summer and will be continued.

Our objective was to train personnel managers. Employees in war plants who with little experience found themselves engaged in personnel work as their plants expanded were selected for training upon nomination of the management. I feel this plan has worked out very successfully.

There is more I could tell you of course. In citing these phases of our work my purpose is to show you that our only concern is to do everything we can to win the war.

To that end we shall leave no stone unturned; turn aside from no rough path; shun no sacrifice.

In the school in which you and I have been raised human life is sacred in the eyes of the law. A citizen is innocent until he is judged guilty by a fair jury. What a contrast we see under the so-called new order imposed upon the suffering peoples of conquered Europe.

WHAT WE ARE FIGHTING FOR

I hope that we shall never live to see the day when, in your country or mine, right gives place to might in the Government of our people.

I need hardly remind the members of this Society that the unfolding of history is the story of freedom broadening down from precedent to precedent.

The history of your own profession is a record of greater liberty to face problems men had thought insuperable and to triumph over them for the common good.

You know that when men acquired freedom of thought engineering and the other sciences began to make their contribution to that greater production upon which we are building a higher standard of living and a better life.

Our two peoples know that we must win this war. Everything we hold dear is at stake. Nothing else has any import. But we shall win, for freemen are stronger than slaves. Freedom shall breathe again in this battered world—and purge it of the stench of tyranny, and hate, and fear.

Then we must work to make the world a better place for all to live in—not for the few—a place where economic security will be a new right for everyone. For freedom is a farce if it means freedom to starve.

Countries such as ours are now able to carry on prodigious war efforts to destroy. If we have the will we can do far more to build this new freedom.

As we say in Canada, we have a tough task ahead but it isn't too tough. We must make it possible in the years to come for our two peoples to sing with greater fervor, "God Bless America" and "O Canada."

EMERGENCY REPAIR OF GAS MAINS

C. S. GOLDSMITH

THE BROOKLYN UNION GAS COMPANY

THREE months before the tragedy of Pearl Harbor, distribution engineers of the Brooklyn Union Gas Company began thinking about what they would do about shutting off the gas flow and making emergency repairs to gas mains if a severe bombing raid disrupted service.

Valves have always been provided on all high-pressure mains to shut off the gas, but on low-pressure mains the expense of installing valves at each street intersection is so great that temporary means of gas shutoff are used. The customary method is to drill a hole in the top of the pipe through which a rubber bag is inserted and inflated with air; or a similar device, known as a "stopper," may be used in place of the bag. Either of these devices will withstand the few inches of water-column pressure usually found in low-pressure mains.

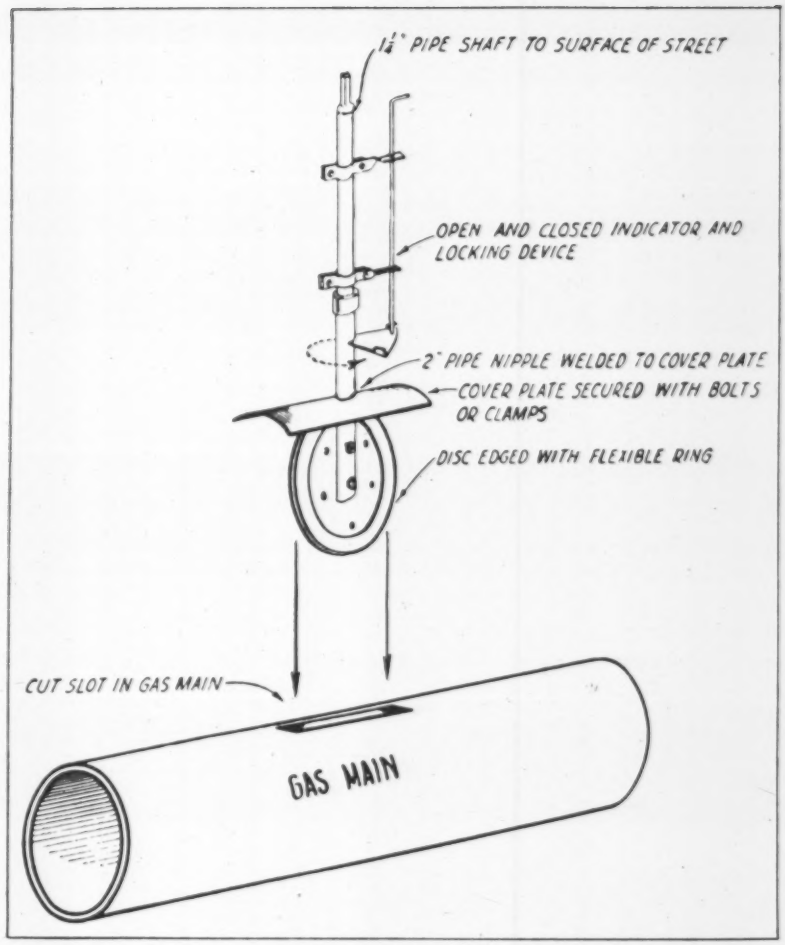

FIG. 1 BUTTERFLY CONTROL VALVE

During peacetime such a method of shutting off the gas is practical because in almost every case the main to be stopped off is exposed in the trench and easily accessible. If a cast-iron main does break, the rupture is circumferential and only a small crack results. Since the main is three feet under the surface of the street and completely surrounded by well-packed soil the escaping gas is so greatly retarded that only a small quantity will find its way to the surface for detection. In such cases it is necessary merely to expose the main at the break, install a clamp, and back-fill, with no interruption of service.

In wartime, however, when the possibility of bombing is always present, other methods must be developed, because an exploding bomb in the street will remove a large section of the main thus permitting gas to escape in large quantity from each end of the severed pipe. Furthermore, as gleaned from the experience of England, the gas is almost sure to be ignited.

The more important of these shutoff methods are: Butterfly control valve, conical plug or stopper, plastic materials, and inflated bag.

BUTTERFLY CONTROL VALVE

A device developed by the San Diego Gas and Electric Company of California is used as an emergency shutoff on low-pressure gas distribution mains from 4 in. to 30 in. diameter. Essentially, the device consists of a disk, similar to a stovepipe damper, which can be rotated 90 deg inside the main. To obtain a good seal against the inside wall of the pipe the periphery of the disk is faced with discarded garden hose or similar tubing. Another method consists of a sheet of $^1/_4$ in. rubber between two metal disks.

The disk is inserted through a longitudinal slot which has to be cut in the top of the gas main, Fig. 1. A cover plate is then bolted or clamped to the main to seal the slot. A rod or shaft is fastened to the disk and extended upward through a stuffing box and into a receptacle placed in the pavement so that the valve may be operated from street surface.

CONICAL PLUG OR STOPPER

Where the ends of the broken main are exposed and not covered up with debris, conical plugs are considered to be the simplest and most practical method of shutting off a main. To date the most satisfactory design has been a plug with a can-shaped body made of 32-gage crimped tin plate and a 26-gage head for added rigidity. Cone-shaped vanes are attached to the head of the can to aid in guiding the plug into the main. The can-shaped body has a concave bead drawn around the periphery at each end of the plug. This bead serves the double purpose of strengthening the plug and providing a means for fastening a leather sheath, Fig. 2. This leather sheath (made of meter-diaphragm leather) is draped on the outside of the plug body over a piece of $^3/_8$-in-outside-diameter rubber tubing located between the two beads, and the leather is then lashed to the can body at each end at the periphery beads.

The tubing is of gum rubber and allows the plug to adapt itself easily to the inside surface of the pipe. The maximum

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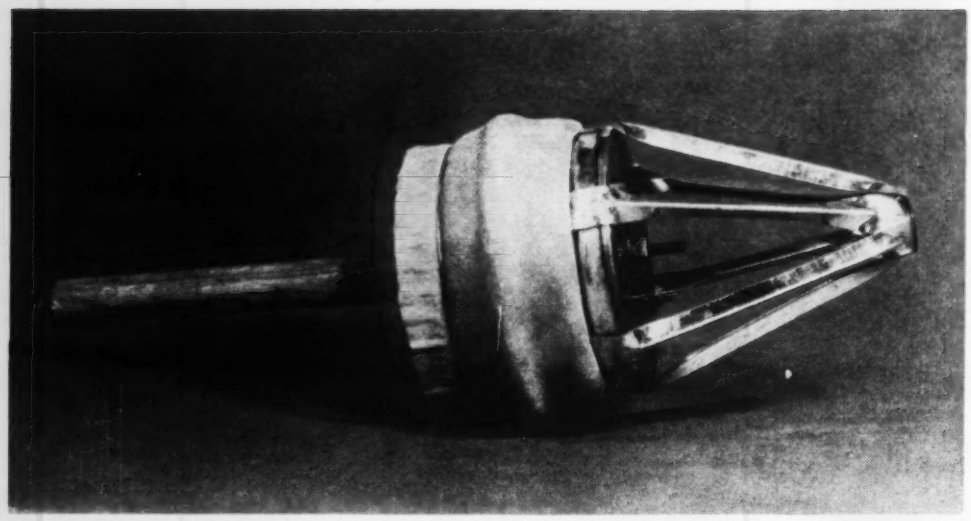

FIG. 2 CONICAL PLUG

diameter of the plug is small enough so that the entire plug can be pushed into the main and thus obtain a shutoff despite the ragged broken edges of the pipe. A heavy coating of grease or soap put on the leather portion of the plug insures an effective seal. Plugs of this type have been designed and made up for mains up to twelve inches in diameter and, although they would be cumbersome, there is no reason why they could not be made for mains over that diameter.

The plug is fastened to a wooden pole of variable length by means of a strong flexible joint. This flexibility is necessary in order to allow the man handling the plug to stand on the edge of the crater rather than in front of the broken main and thus avoid to a great extent the issuing gas, or flames if the gas is burning. The flexible joint and the construction of the plug permit the plug to align itself properly inside the main regardless of the angle at which it is introduced. The plug, of course, may be left in the main and the handle removed until it is convenient for permanent repairs to be made.

The wooden pole is of sectional construction, each section being about eight feet long and fitted with ferrules at each end, similar to those on a fishing pole. As a result, the pole can be extended to any length required by merely adding sections.

The weight of the plug at the end of the pole is supported by a cable that is carried by two men walking on opposite edges

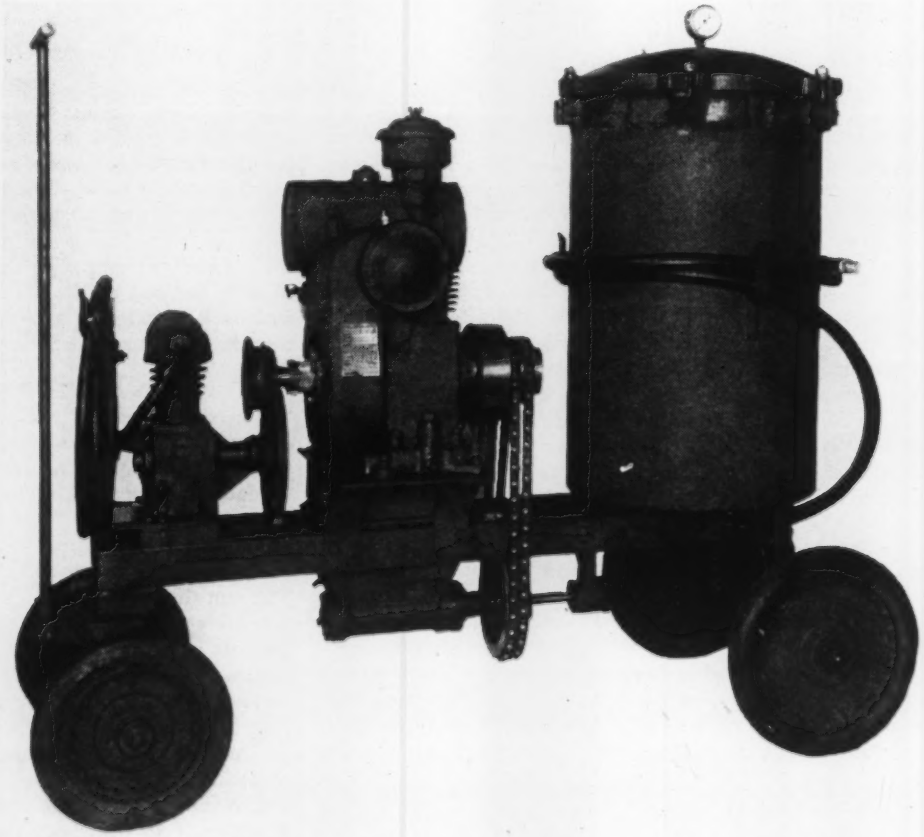

FIG. 3 EQUIPMENT FOR PUMPING PLASTICS INTO MAIN

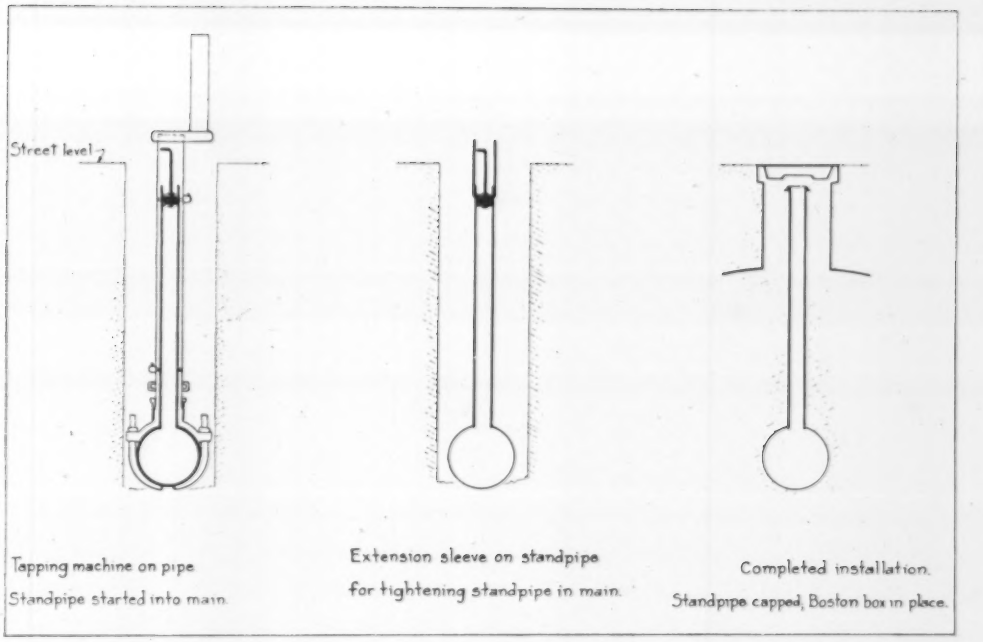

FIG. 4 METHOD OF INSTALLING STANDPIPES

of the crater. In this way the man carrying the pole is relieved of the dead weight at the end of the pole, and the operation is carried out much more smoothly and accurately.

Another type of plug, one that has been used extensively in England, consists of a metal cone followed by a rubber disk. The disk is made of discarded conveyer belting cut to the inside diameter of the pipe and the edge is chamfered so that it can be inserted easily. Tests show, however, that the seal effected by this type of plug is not nearly so good as that obtained with the can-shaped plug.

PLASTIC MATERIALS

Since the premises of every gas consumer are connected to a gas main somewhere out in the street, ready access to the interior of a main may be had through the small pipe, known as a "service," leading from the main to the premises.

The Philadelphia Gas Works Company, who first made use of this setup to plug off a main, gained access to a consumer's cellar, disconnected the meter, and pumped a heavy grease into the main via the service pipe. The method was so successful that other gas companies picked up the idea, improved upon it, and thereby gained a simple but effective means of shutting off a low-pressure gas main in case of bombing damage to their system.

Various types of pumping units have been tried, most of which have been powered by compressed air, gas engine, or electric motor. Hand operation of a pump is too slow to be effective.

We use a self-contained unit in which all the essentials are combined. A $2\frac{1}{2}$-hp gasoline engine drives a piston-type pump and also a small air compressor to obtain compressed air to assist in feeding the grease to the pump, Fig. 3.

In operation, the pumping unit is placed as near as practicable to a cellar door or window, a rubber hose is connected between

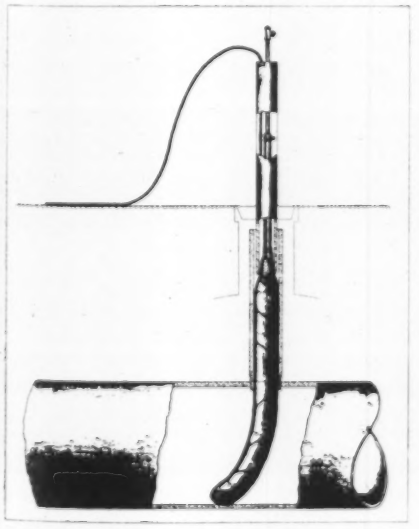

FIG. 5 METHOD OF INSERTING BAG INTO MAIN THROUGH STANDPIPE

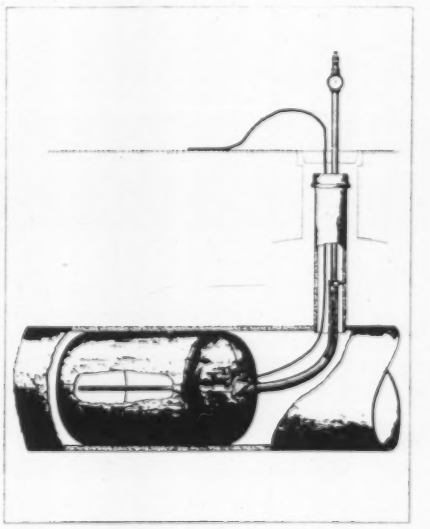

FIG. 6 CANVAS-COVERED RUBBER BAG INFLATED INSIDE MAIN

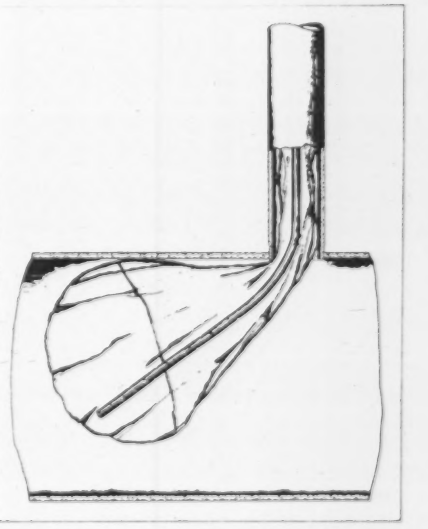

FIG. 7 METHOD OF RELEASING AIR FROM BAG FOR EASY REMOVAL FROM MAIN

the pump and the consumer's end of the service, and a sufficient quantity of plastic material is pumped into the main to seal off the gas flow. The whole operation requires about five minutes on a 6-in. main. If a heavy grease has been pumped into the main it is difficult to remove it and for that reason other plastic materials have been tried which will lend themselves to later reduction either by heat or a solvent. One such material will be mentioned here. A heavy wax is available which may be thinned to the right consistency and pumped into a main as readily as grease. Hot water or steam will not only quickly melt the wax but will hold it in suspension. Once it is dissolved in water it remains dissolved until such time as the water is completely evaporated; by this means the wax may be reclaimed.

INFLATED BAG

The methods of sealing off low-pressure gas mains by means of conical plugs or plastic materials are adequate on mains up to 12 in. in diameter. On low-pressure mains of larger diameters, the bagging off method has to be used.

As mentioned previously in this paper, spherical rubber bags inflated with air have been used for years and are still being used for shutting off low-pressure gas mains in regular peacetime operations. Rubber bags may be used in wartime also if certain preparations are made in advance to permit the bags to enter the mains quickly.

Briefly, the preliminary setup is to install standpipes in the larger-size low-pressure mains at intervals of three or four blocks and then to modify the rubber bags to adapt them for entering the mains via the standpipes. After such preliminary preparations have been made and a bombing raid occurs, during which some of these large mains are fractured, it becomes a simple matter to dispatch crews to the incidents provided with the necessary equipment to insert the bags quickly down through the standpipes, inflate them with air, and thus close off the ruptured mains.

Since hundreds of standpipes must be installed, this procedure becomes very expensive unless some method is evolved to install the pipes in the tops of the mains without excavating large openings in the street. We therefore developed a drilling and tapping machine, Fig. 4, which would operate in an opening just large enough to admit the machine. This device operates with compressed air and will drill and tap a hole in the top of a gas main three feet below street level in one operation. The drill and tap is then withdrawn and a length of pipe of the required diameter is inserted down through the machine and screwed into the top of the main without the escape of gas. The machine is then removed, the opening is backfilled with dirt, a Boston box is installed, and the standpipe is ready for use in any emergency. Figs. 5, 6, and 7 illustrate how the device is used.

EMERGENCY REPAIR

After the flow of gas has been stopped by any of the described methods the next concern is how best to restore the ruptured main for the resumption of service. Here again our peacetime methods are not applicable because they are too slow.

In regular practice if a cast-iron main has been badly damaged or torn up by any one of several causes, such as a cave-in or a contractor's steam shovel, the jagged ends of the pipe are cut off and lengths of additional pipe are installed to fill in the gap. This method is practical since only one such break is encountered at a time and the final result is a permanent repair.

A bombing raid, however, might conceivably produce dozens of such instances and length of time for restoration becomes the prime consideration. No longer can we cut off the jagged ends of the main and then consume additional time in fitting lengths

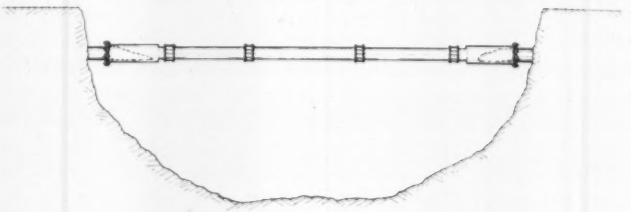

FIG. 9 EMERGENCY REPAIR

of pipe to exactly fill the gap. The irregular fractures of the shattered pipe ends to be rejoined preclude the use of ordinary couplings or sleeves, which probably will not be of sufficient length to reach the sound pipe beyond the fracture.

Working in collaboration with a maker of pipe couplings and special fittings, we finally developed what we believe to be the simplest method of restoring a main in the least possible time.

The essential design of this device is a long steel sleeve of sufficient diameter to slide back over the end of the cast-iron pipe to be coupled thereto by means of a rubber gasket and follower ring, Fig. 8. The fill-in pieces used to bridge the gap between two of these special fittings are lengths of ordinary steel pipe coupled together with standard mechanical couplings, Fig. 9. Hence, any distance between the two broken ends of a cast iron main may be bridged without loss of time in cutting and fitting pipe.

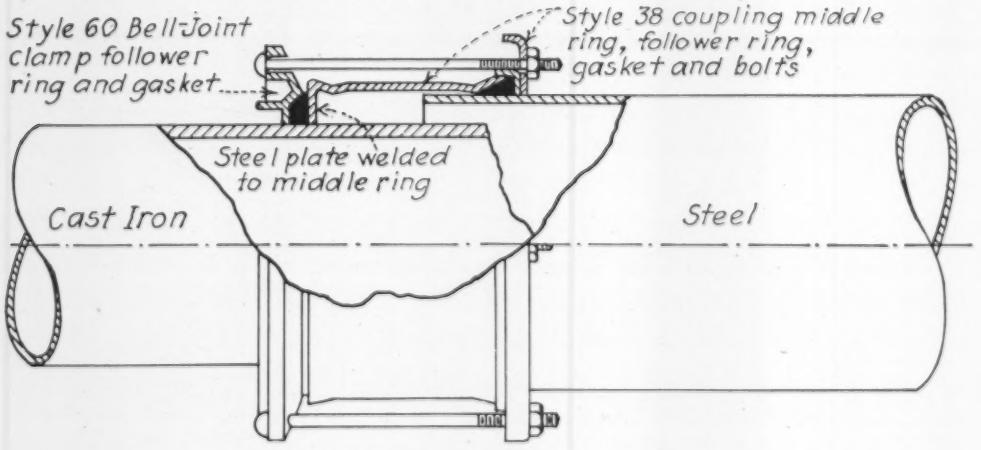

FIG. 8 PROPOSED EMERGENCY REPAIR JOINT

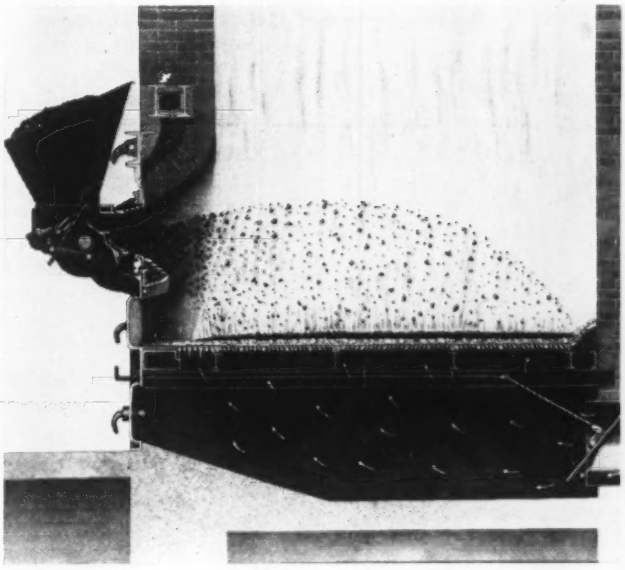

FIG. 1 STOKER WITH HAND-CLEANED STATIONARY GRATES

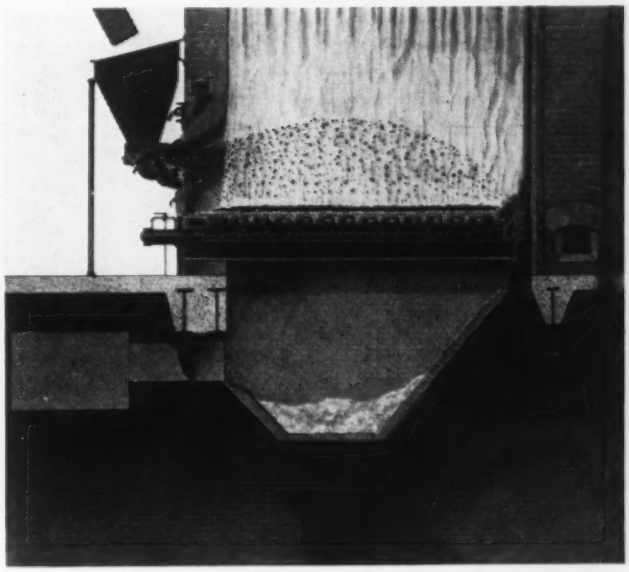

FIG 2 STOKER WITH POWER-OPERATED DUMPING GRATES

Recent Developments in SPREADER-STOKER FIRING

By R. L. BEERS

VICE-PRESIDENT, CHARGE OF ENGINEERING, DETROIT STOKER COMPANY, DETROIT, MICH.

DURING recent years there has been a rapid growth in spreader-stoker firing. Although this method of burning coal is very old, having been used both in this country and in England at least fifty years ago, it was practically abandoned and only in recent years has it attained popularity. The early stokers used a natural-draft type of grate with large air openings, were operated with poorly applied regulation or none at all, and were principally an attempt to duplicate hand firing. The results with these stokers were considered unsatisfactory and were gradually replaced with overfeed moving and chain-grate natural-draft types of stokers and these in turn were gradually superseded by more efficient and higher-capacity forced-draft types.

With the wide variety of fuels available, different load and personnel conditions, and furnace temperatures higher than the melting point of iron, problems have naturally been encountered with all types of firing equipment. There probably have been as many ideas suggested and tried for improving stokers as for any other kind of equipment. We have had a number of different types of stokers with many modifications for obtaining the most practical results. However, for the past twenty to thirty years we have practically standardized on underfeed stokers with pulverized fuel for our largest boiler units and forced-draft chain- or traveling-grate stokers for certain noncoking fuels. There have been many refinements and improvements but there has been no recent major change in stoker firing until the present revival of spreader-stoker firing.

In an endeavor to burn more satisfactorily some of the Western lignites which were being handled with underfeed and chain-grate stokers an investigation was made of some spreader stokers that were in operation in North Dakota and western Canada. It was found that lignite fuels in these sections were being handled quite successfully with spreader stokers. A stoker of this type was then developed, after considerable experimental work in the development of a new design of feeder with a new design of forced-draft grate and was installed in Colorado for burning lignite. It worked out more satisfactorily than was anticipated, producing higher efficiencies than had before been possible. Efficiencies of the boiler and economizer of about 82 per cent using lignite containing 20 per cent moisture and 9500 Btu per lb were obtained. The installation created considerable interest because of its remarkable performance. It operated continuously for periods of six months at a time without a shutdown which was necessary only for regular inspection.

Spreader stokers were also installed with a modified design of grate in some of our eastern plants burning bituminous fuels. With the improved feeders and grates entirely different results were obtained as compared with the early type of natural-draft spreader stoker. It was found that coal could be burned at very high rates. Inferior grades of fuels having ash with low fusing temperatures could be handled much more satisfactorily than on other types of stokers. Fuels could be burned that could not be handled on other types. The coal

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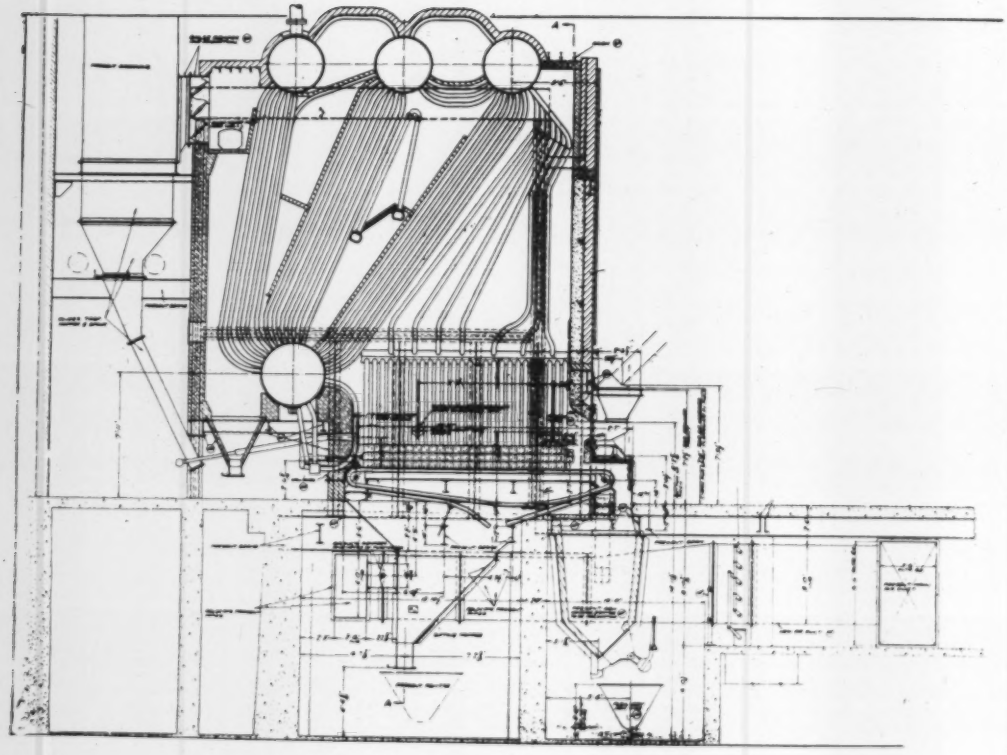

FIG. 3 SIDE ELEVATION OF CONTINUOUS-CLEANING GRATE AND 612-HP BOILER

grate line and located on the front wall of the furnace. These units consist of a variable feeding device for conveying the coal to a rotor on which blades are mounted. These revolving blades strike the incoming fuel and throw or sprinkle it uniformly over the entire grate surface which consists of horizontal forced-draft grates. The fine particles of the fuel are burned in suspension and the coarse coal is burned on the grate. The latter has restricted air openings which give uniform air distribution, admit the air at high velocity, and create turbulence and rapid burning. The fresh coal is thrown on top of the fuel bed and ignition is instantaneous. The ash, which is always at the bottom of the fuel bed, is chilled by the incoming air, thus tending to reduce the formation ofclinker and acting as a heat insulator to protect the grates

burned practically as fast as it was fed into the furnace. A change in the ratio of the coal and air supply almost instantly changed the carbon-dioxide content of the flue gases. The maintenance of the grates was extremely low. It was found by tests that the temperature of the iron in the grates, as soon as a layer of ash was formed, was approximately the same as the temperature of the incoming air. Coking coals would burn without the formation of coke, this being due to the thin fire and rapid combustion. As much capacity could be obtained with $^1/_4$-in. screenings as with nut-size coal. The ash was practically free of clinkers and had a low carbon content. The boilers could be quickly put on or taken off the line, thus increasing flexibility and reducing stand-by losses. The operator could change from one fuel to another without noting any particular difference.

The modern spreader stoker consists essentially of coal-feeding units spaced above the

TABLE 1 TYPICAL TEST RESULTS WITH STATIONARY AND DUMPING GRATES

Test	*A*	*B*	*C*	*D*	*E*	*F*	*G*
Boiler heating surface, sq ft	4,790	3,364	7,860	7,350	3,995	4,200	6,180
Economizer	Yes	Yes	Yes	Yes	No	No	No
Air heater	Yes	Yes	No	No	Yes	No	No
Type of grate	Sta.	Sta.	Dump	Dump	Dump	Dump	Dump
Evaporation from and at 212 F, lb per hr	21,200	25,624	97,850	61,839	18,695	29,846	20,822
CO_2, per cent	12.35	12.86	14.30	14.68	14.18	14.60	12.90
Final gas temp, F	292	297	387	386	326	502	455
Air temp, F	299	302	82	79	276	74	70
Combustible in refuse, per cent	13.0	7.3	11.25	11.31	5.7	2.68	
Coal as fired, Btu per lb	14,167	12,165	11,793	11,463	10,756	9,549	7,186
Ash in coal, per cent	5.4	12.41	10.76	7.31	11.21	7.35	7.28
Sulphur, per cent	0.8	2.19	1.25	1.41	1.55	0.45	0.29
Heat release, Btu per cu ft	42,400	47,000	26,400	24,080	16,000	30,500	21,200
Losses: Moisture, per cent	0.24	0.47	1.07	1.34	1.49	3.08	5.9
Hydrogen, per cent	3.78	3.76	3.00	4.83	3.85	4.55	5.27
Dry flue gas, per cent	5.22	5.55	7.45	7.04	5.25	10.35	9.91
Combustible, per cent	0.79	1.07	0.95	0.72	0.61	0.15	0.54
Radiation and unaccounted, per cent	2.47	4.00	2.15	2.13	4.73	4.08	5.2
Heat absorbed by unit, per cent	87.5	85.14	85.38	83.94	84.07	77.81	73.18

TABLE 2 TEST RESULTS WITH 612-HP BOILER AND CONTINUOUS-CLEANING GRATE

Test no.	1	2	3	4	5	6
Evaporation from and at 212 F, lb per hr	34,648	35,116	44,211	50,370	35,189	46,295
CO_2, per cent	14.3	14.2	13.8	14.8	14.5	14.8
Flue-gas temp, F	513	521	566	581	520	569
Combustible in refuse, per cent	4.68	3.47	4.99	3.01	3.91	4.08
Coal as fired, Btu per lb	10,414	9,762	9,917	9,927	10,055	10,179
Ash in coal, per cent	14.5	16.59	16.79	16.08	14.8	14.31
Sulphur, per cent	6.72	7.2	7.52	5.48	6.48	7.29
Heat release, Btu per cu ft	17,650	17,400	23,800	25,400	17,750	23,700
Losses: Moisture, per cent	1.82	2.28	2.06	2.30	2.02	2.11
Hydrogen, per cent	4.54	4.57	4.62	4.73	4.63	4.29
Dry flue gas, per cent	9.43	9.8	11.0	10.98	9.72	10.40
Combustible in refuse, per cent	0.57	0.37	0.55	0.38	0.52	0.38
Radiation and unaccounted, per cent	4.42	2.59	6.50	2.53	3.96	4.81
Heat absorbed by boiler, per cent	79.22	80.39	75.27	79.08	79.15	78.01

from the high temperatures above. Furthermore, it is not necessary to disturb the fuel bed, which would cause the formation of clinkers and overheating of the grates.

The first installations of this modern stoker for bituminous coal used a hand-cleaned stationary grate with an undivided air chamber and was equipped with start-and stop automatic control. Although this stoker gave promising results, showing the possibilities of this method of firing, it was felt that improved results could be obtained, particularly for larger installations, by having a floating control for the coal feed and air supply and by using grates which could be more easily and more quickly cleaned. Coal feeders were developed with variable coal-feed control which could be connected to a floating type of automatic regulating system. This feeder has as a new feature a rotor of the overrunning design which gave uniform distribution of the coal and made it possible to adapt it to longer grates. With this overrunning feeder, close clearance between the blades and the rotor housing was not required, which resulted in quiet operation and reduced wear. Furthermore, it was found that with this overrunning rotor a more uniform distribution or spraying of coal from front to rear was obtained. This was due to the fact that a particle of coal hit by the tip of the blade was projected at a higher velocity than a particle of coal which was hit at a point lower or nearer the center of the rotor. By changing the "spilling" point of the coal over the rotor from front to rear, the angle at which the blade strikes the coal can be controlled and hence the distribution of fuel on the grate can also be controlled. In addition, a variable-speed drive is provided for the rotors to control distribution, although normally the rotors operate at a constant speed.

To permit more rapid cleaning of the grates, power-operated dumping grates were used. The air chamber or ashpit was divided to provide a separate chamber for each feeder and each section of the grate. Consequently, in cleaning one section the air and coal supply could be shut off without interfering with the other sections, thus reducing excess air in the furnace. With ordinary operation the fires were cleaned after ash had accumulated on the grates to a depth of 4 to 6 in. With the power-operated grates it was found possible to clean a section in two to three minutes. Fig. 1 shows a stoker with hand-cleaned stationary grates and Fig. 2 a stoker with power-operated dumping grates. The latter have deep nonsifting joints for minimizing air leakage between the sections.

For larger boilers and higher burning rates it was found desirable to increase the furnace turbulence, and overfire air jets were used with considerable success. It was also found that with this type of burning considerable overfire air could be used which actually improved the furnace conditions, making it possible to carry a higher CO_2 and reduce the length of flame.

Owing to the fact that the fine particles of coal are burned in suspension the fly ash and cinder carry-over became a problem in many cases. The fly ash is comparatively coarse, fairly easy to separate, and contains sufficient carbon to justify reburning. For plants operating with natural draft, low-draft-loss cinder traps give satisfactory separation. For plants using an induced-draft fan, a cyclone form of trap or a cinder-separating fan proves effective. Trial installations have proved that the fly ash will readily burn when injected into the furnace. Steam jets were tried for reinjection but were costly to operate and caused more or less trouble in maintaining satisfactory operation. A system was developed for continuously conveying the fly ash, recovered from the boiler soot hoppers and cinder traps, back to the furnace by means of a small high-pressure fan. This fan served the double purpose of conveying the fly ash for reburning and of creating desirable turbulence in the furnace. This recovery and return of the fly ash in most cases is well justified on grounds of economy and avoidance of a nuisance.

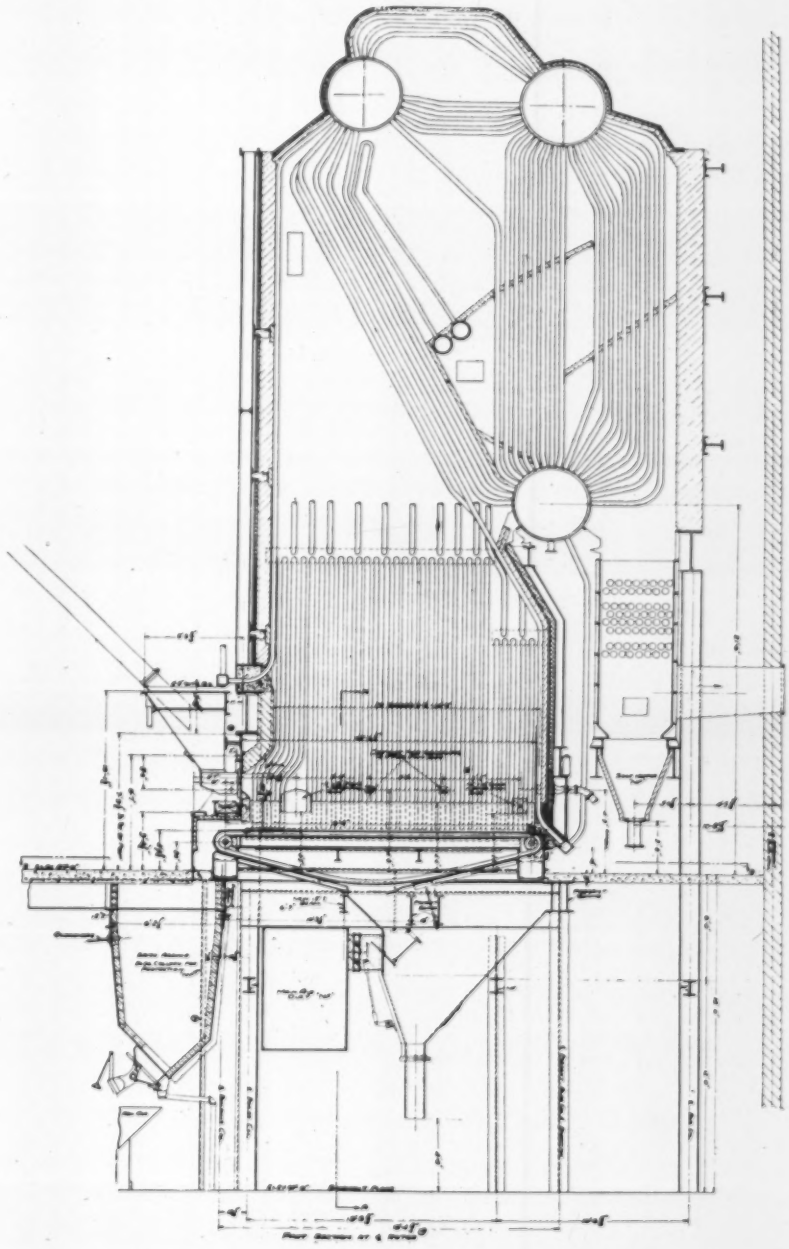

FIG. 4 SIDE ELEVATION OF CONTINUOUS-CLEANING GRATE AND BOILER WITH CAPACITY OF 210,000 POUNDS OF STEAM PER HOUR

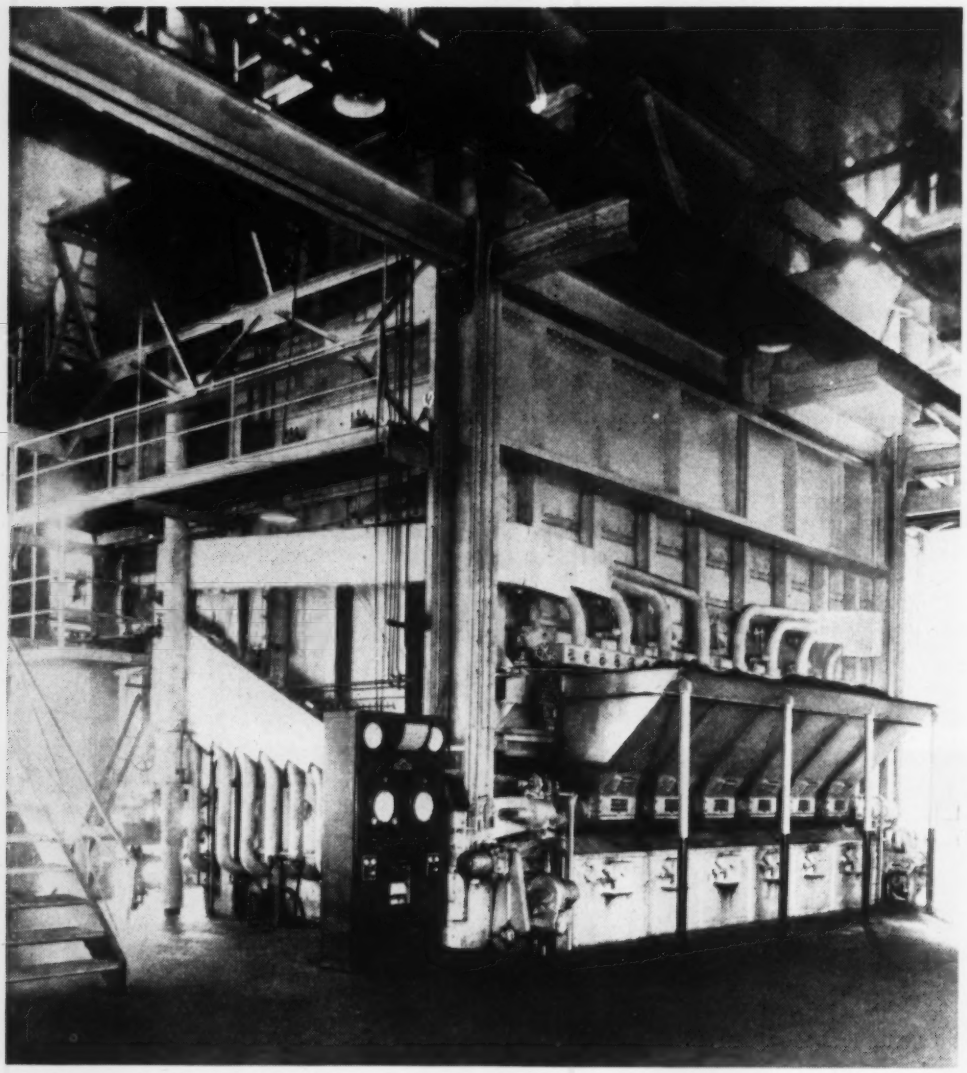

FIG. 5 EXTERIOR VIEW OF SETTING OF 210,000-POUND UNIT

In installations where a fly-ash nuisance developed, this condition invariably was brought about by lack of proper precautions in trapping the fly ash and in not providing suitable means for its disposal.

Table 1 gives some typical test results with stationary and dumping grates with various grades of coal. Test *B* was made with $^3/_4$-in. Ohio screenings; for test *E* the coal was Illinois $^5/_{16}$-in. screenings. For other tests fuel used was $1^1/_4$-in. screenings.

Although spreader stokers with power-operated dumping grates were applied to a number of boilers having capacities of 100,000 lb of steam per hour and larger and have produced very satisfactory results, it was felt desirable to eliminate the varying fuel-bed conditions, i.e., variation in depth of the ash, and the interruption in furnace conditions which occur during the cleaning periods. With large boilers containing several feeders and several sections of grates an interruption for cleaning might prove quite serious, particularly if the coal had a fairly high ash content. The period between cleaning of grates naturally varies according to the rate of burning and the amount of ash in the fuel.

Some coals have such a high ash content that the dumping grate is not entirely satisfactory. Unless a low rate of combustion is maintained with some fuels cleaning of the grates would possibly be necessary once every hour, although with a low-ash coal cleaning might be required only once in eight hours or more. To overcome this deficiency a continuous-cleaning type of grate was developed. Fig. 3 shows the first installation of this type made at the State University of Iowa under 612-hp boilers. This grate is of a special traveling design with overlapping nonsifting joints. It has the novel feature of discharging the ash at the front end of the boiler. The grate travels forward at low speed. The movement is considerably slower than with the conventional chain-grate stoker which has to travel fast enough to feed the right amount of coal. However, the grate of the spreader stoker has to travel only fast enough to discharge the ash. For the average installation using a coal containing 8 per cent ash and burning 60 lb of coal per hour per square foot of grate area the rate of travel is approximately $^3/_8$ in. per min. This slow travel allows ample ash insulation so that the grates operate at a low temperature. The operation is the reverse of the ordinary chain-grate stoker where the ignition is at the top of the fuel bed at the front, with green coal underneath, and where, at the rear end, the ash is on top and the fire underneath. Also, with an underfeed stoker the ash is at the top with the burning coals underneath. With the spreader stoker the ash is always at the bottom where it insulates the grates and is kept at a comparatively low temperature by the air passing through it.

With forward grate travel the rear end of the grate can be sealed off, which is desirable, as the fuel cannot always be thrown exactly the same distance, and with excess air admitted through the front end of the grates for burning the fine particles of coal in suspensions, the ash discharged on the grate is practically free of combustible matter. Tests have shown the carbon content to vary between $1^1/_2$ to 5 per cent. The ash is practically free of hard clinkers even with some of the lowest-grade coals which contain approximately 7 per cent sulphur and have fusing temperatures of 1900 F. Table 2 shows the results of tests made with Iowa coal at the plant just mentioned. These were weighed-water tests and considerable precaution was taken to obtain accurate results. Owing to the fact that there is only a two- or three-minute supply of coal on the grates at any time, there is little chance for error in judging fuel-bed conditions. Considerably higher capacities were possible with the stoker and furnace but could not be carried owing to the excessive pressure drop through the boiler dry pipe. Fig. 4 illustrates an installation designed for 210,000 lb of steam per hr. Loads up to 225,000 lb per hr have been carried. This plant burns Indiana coal averaging about 10,500 Btu per lb. Daily efficiencies of about 83 per cent are obtained with a combustion rate of approximately 65 lb of coal per sq ft of grate area. The stoker in this plant has burned more than 90,000 tons of coal without any grate replacement to date and the grates today show no sign of growth or overheating. Fig. 5 is an exterior view of this installation, which has six coal-feeding units. Fig. 6 shows a smaller installation in a public-utility plant; it consists of five boilers, each of which evaporates 100,000 lb of steam per hour.

With the application of spreader stokers it is desirable to provide ample combustion space. Heat releases below 35,000 Btu per cu ft give best results, although many installations operate with higher heat releases.

As the grates operate at low temperature—close to the temperature of the incoming air—preheated air can be used to good advantage. Installations are in operation using air temperatures of 400 F; however, judgment should be used to carry lower temperatures with some fuels which contain ash having a low fusing temperature. Waterwalls are practically essential, except for small boilers, to prevent high refractory maintenance. It is desirable, however, to use only sufficient cooling to protect the walls. Too much cooling, at the lower combustion rates, may be detrimental to most efficient operation and interfere with smokeless operation. With this continuous-cleaning stoker the power requirements are low, a factor which may have considerable bearing on the over-all plant economy. Little power is required for the grates and the feeders, approximately $^1/_3$ hp per 1000 lb of coal per hr, and the air pressure under the grates seldom exceeds 2 in. water pressure.

Spreader firing has shown little tendency toward slag formation on boiler tubes. Even with furnaces with refractory walls operated with low excess air and at high capacities and using fuels having low-fusing ash there may have been considerable slagging of the walls but little slagging on the tubes.

With the spreader stoker smoke can be quickly produced if too much coal is fed into the furnace for the amount of air supplied. Likewise the smoke can be quickly eliminated by increasing the ratio of air to coal, assuming that the heat release is not excessive or the combustion rate too low for maintaining ample furnace temperature. Owing to the sensitiveness, or quick response, to changes in the ratio of coal and air supply and the corresponding immediate change in carbon dioxide in the flue gas, it is desirable to provide good automatic-control equipment to maintain the proper draft and ratio of coal to air with the fluctuations of load.

Although difficulties have been encountered in spreader-stoker firing they have been comparatively simple to overcome. With the many advantages, including the ability to burn an unusually wide range of fuels with high plant economy and outstanding reliability, it is evident that sound reasons exist for the rapid growth of this method of burning coal.

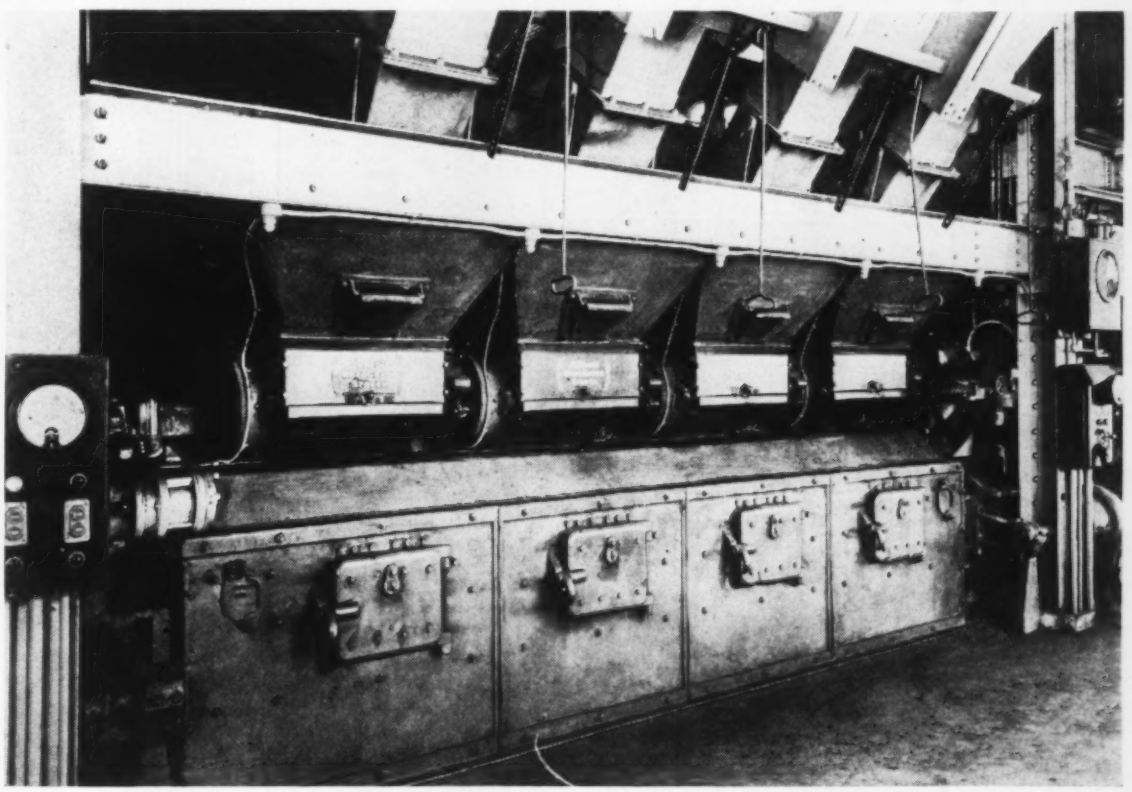

FIG. 6 FRONT VIEW OF STOKER FOR 100,000 UNIT BURNING MIDWESTERN FUEL

MEETING POWER DEMAND DURING WAR

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MODERN warfare requires matériel in quantity and variety far exceeding any experiences of the past, and adequate electric-power supply is a prime requisite for war production. There has been extensive discussion of this broad subject, leaving little new to be said. Nevertheless, it may be useful to review the problems presented in meeting demands for electric power in wartime, and the measures applied in solving them.

While steel, copper, and other important materials are rationed, and transportation and communication facilities are strained, the war power load—several millions of kilowatts—will be carried successfully by privately owned systems, public developments, and industrial power plants.

Meeting war-load demands is largely an electrical problem, although important mechanical elements are involved; it will, therefore, be necessary in covering the subject to break over into the neighboring professional field.

LOAD ESTIMATES AND POWER CAPABILITIES

There has been a flood of "releases," concerning the power situation, from Federal boards, bureaus, commissions, and departments. In response to requests from Washington and elsewhere, including elaborate questionnaires, data of many kinds and in many different forms have been prepared by the private utilities.

The Federal Power Commission has, as is well known, done a very great amount of statistical work in charting electric loads and capabilities. However, the Power Branch of the War Production Board, not finding in these compilations all the answers to its questions, has during months past been obtaining, largely from utilities, statistical data as to relation of interconnected-system capabilities and expectable total loads, subdividing the country into power areas for that purpose.

Many of the predictions as to availability of power, by the Federal Power Commission and others, have been rather pessimistic. Fear was entertained in certain quarters as to a serious power shortage in 1942, and some authorities are predicting shortages for 1943, and later. Forecasts have been based on a number of assumptions: such as, for instance, that power load will be a straight-line function of appropriations for war production, or that energy consumption will be proportional to man-hours of labor.

Utility staffs have drawn up their own estimates comparing future loads with figured system capabilities. It has been realized that the results of these studies can be only approximate, in particular because accurate prediction of war-load increment is impossible. The situation is usually complicated by system interconnections, with resulting diversities, and involving purchase, sale, and interchange of various classes of power and energy. In some cases, with hydroelectric supply prevailing, the energy available through a year or a season becomes the critical element; in others, peak-carrying capability. It has occasionally been found desirable to project a load curve by three or more alternate lines; perhaps with the first indicating normal trend of load growth, a second including probable or assured net war increment, and a third all proposed war loads. In one system, for example, the "normal" load for 1942 was estimated as 300,000 kw load with probable war addition 350,000, and with possible war increment 450,000 kw.

In practically all cases, power has been available, up to the present, for war demands, with no enforced curtailment of normal loads. An exceptional case was during 1941, in the Southeast; e.g., for a period in the fall certain nonessential load curtailment was required. The difficulty was occasioned by deficient rainfall over the Tennessee Valley Authority system and in Georgia and Alabama. There was a call for all possible assistance from private utilities surrounding that area. During one week, for example, an average of 340,000 kw was poured into Tennessee and Georgia and supplied to aluminum works in Carolina, from north, east, and southwest. This power was supplied, in large measure, by "displacement;" it originated from points as far distant as northern Indiana and western Texas.

Recent estimates by the Federal Power Commission and the Edison Electric Institute indicate that total electric-generating capacity in the country, including private and public power developments, approximates 46,000,000 kw. The sum of peak loads (noncoincident), during the peak period in December of this year (1942), is difficult to estimate; it may amount to 38,000,000 kw. This would leave a nominal reserve of 8,000,000 kw; less than that would be available for load carrying, because of location and of transmission limitations, but on the other hand there should be some benefit from diversity. Reserves can of course be used more effectively if future war loads are spotted in localities where excess capacities are available or where they may be made available by relatively low-cost transmission connections; choice of location for new loads is not always in accordance with this principle.

As an example of estimated load-capacity conditions, the situation in a large region of the South and Southwest may be cited: This region, which contains many important war loads and has been considered a critical area, now appears to have a surplus of capacity, over expected 1943 load, of 250,000 kw or about 10 per cent. Surplus of this magnitude, if available where needed, appears sufficient, particularly in the present emergency.

Industrial data indicate an increase in energy output, 1942 over 1941, of from 12 to 14 per cent. Federal Power Commission estimates, based on data from utility companies, indicate that increase in energy output for 1943, as compared to 1942, will be yet greater. The aggregate power load in the United States for July, 1942, was between 8 and 9 per cent above that for the same month in 1941; for December of this year increase in peak above that a year earlier is now expected to be 14 per cent or even more. The Federal Power Commission estimates that peak demand in December, 1943, will be about 10 per cent higher than that in December, 1942. The various figures presented are not wholly consistent, and reliable forecast of future

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loads is hardly practicable; in any event, energy and power loads are still growing rapidly.

It appears that the trend of the aggregate-load curve is steeper than that of the total-capability curve, and the approach of these two will be accelerated by the order of the War Production Board issued in August, 1942, to suspend certain power developments. It is stated by W.P.B. that this reduction in program "enhances the probability of . . . . . curtailment in use of electricity for civilian purposes, especially during 1943, and thereafter." It is brought out that standards of reliability of service may have to be compromised, and that "civilian inconvenience and sacrifice must be expected, particularly during periods of drought or other adverse weather conditions, or in event of serious accidents affecting utility systems, or in case of unexpected large increases in power requirements for war production."

However, it is now (October) expected that 1942 can be taken care of with little or no mandatory curtailment of normal load, and with full supply to developing war loads. Conditions during 1943 cannot be predicted with confidence. It is probable that the year may be negotiated, without curtailment of war load, by power capabilities now available plus increases scheduled for this year and next; however, time of completion of certain of the major power developments, quantities of hydroelectric energy available, and magnitude of war-load increment, cannot be foretold. Curtailment of nonessential loads may well be required, for short periods, in certain limited areas.

Recent information from Ontario and Quebec is to the effect that radical power rationing must be resorted to, in the effort to overcome a figured deficit of 300,000 kw. It is not improbable that this deficiency will affect conditions in northern New York State, where interconnections with Canadian transmission systems exist.

EXPANSION OF POWER FACILITIES

In situations such as have existed during the past two years, it has been difficult for a private utility to plan its construction program. During the past, in many quarters, it has been the policy to take on practically all load offered or obtainable; whether this policy is founded on a hard commercial basis or whether an element of prestige is involved need not be argued. Following that general principle, utilities have, in this emergency, usually tried to prepare for all expectable load, including normal and war increment, and a large number of power developments, aggregating millions of kilowatts, have been projected during the past two or three years. Very heavy commitments have been made for additional plant, in spite of the fact that conditions after the war are impossible to predict; in some instances, there is possibility or even probability that large excess capability will be available with the dropping off of war load.

Under such conditions, the exercise of discretion becomes difficult. Company executives have had to determine—subject to direction by the War Production Board—whether to provide new capacity, attempt to buy power, or to "sit tight." Decision has of course been guided by the knowledge of existing financial and general conditions and the necessity of maintaining corporate vigor through the coming years.

In determining power projects to be developed, some companies have still attempted to maintain "firm" capability for expected loads, with usual reserves for load protection; others have found it expedient or necessary to figure gross system capability as against loads dispensing, for peak-load portions of the year during the emergency period, with the reserve normally considered essential. Opinions concerning the advisable reserve differ widely, with large metropolitan companies taking a very conservative view and with other smaller systems reducing the allowance to the magnitude of the largest single unit or to 10 per cent of total load, whichever is greater.

The recent order of W.P.B. curtailed the previously approved plant-construction program, which had provided for installation, up to 1944 or 1945, of approximately 10,000,000 kw in power plants. Approval was confirmed for completion of 5,500,000 kw in power projects during the remainder of 1942, year 1943, and early part of 1944; 40 per cent of this represents public developments, of which over one half is in Bureau of Reclamation hydroelectric projects. Work was halted on about 90 projects, most of them steam, aggregating over 2,000,000 kw; two thirds of these were private-utility and one third were municipal installations. Public hydroelectric installations, totaling nearly 2,000,000 kw, were put on lower priorities, but still held in the approved class, presumably to be resumed when materials become available.

EXAMPLES OF WAR LOADS

A schedule of the specific loads now chargeable to conduct of war and production for war is unnecessary here. Prominently included are works for production of aluminum, magnesium, and other materials; plants for production of raw materials for synthetic rubber, of high-octane gasoline, and of explosives and materials contributing thereto; shipyards; warplane factories and assembly works; shell-loading plants; Navy yards and camps. A few examples of war loads may be cited—from those with which the writer is familiar. Practically all utility companies have similar situations on their properties.

The big Higgins shipyard project at New Orleans was suddenly announced by the United States Maritime Commission, and a contract was reported as let for the construction of two hundred 10,500-ton Liberty ships, totaling a good part of a billion dollars. Soon, men were swarming over the two square miles of site, practically at Gulf tide level, in the swamps east of New Orleans, the pumping of 10,000,000 cu yd of fill was started, 150,000 piles were purchased, and plans were laid to launch the first ship within 6 months, with a schedule of 6 vessels per week beginning early in 1943. It was stated that over 5000 welding equipments would be required; if each of these is 4 ft long, there would be 4 miles of welders. One estimate for labor required by the job called for 75,000 men, white and colored. Estimates of shipyard construction cost rose from around $30,000,000 to about double that. Forecasts of project loads ranged from 40,000 kw to as high as 80,000. W.P.B. laid out a 60,000-kw power station to serve the load, utilizing three secondhand turbogenerators of three different makes, three steam pressures and temperatures, and three voltages, together with a new topping turbine and two steam generators of different designs; the new equipment was diverted from power developments under way elsewhere. The fate of this project is well known; the work was abandoned largely because existing yards could utilize all ship plates that would be available.

Dow Chemical has a plant on the Texas Gulf Coast, for the production of magnesium and other materials from sea water. With the tremendous increase in plans for airplane construction, this plant has been enlarged from time to time. The total load will be about 250,000 kw, in large measure supplied by power stations built adjacent to the Dow plants, but with assistance from a neighboring utility. The most recent steam plant, serving Dow Chemical, as directed by W.P.B., includes two good-sized low-pressure secondhand turbines obtained from northern utilities, together with a new topping turbine, the combined capacity aggregating about 125,000 kw.

Among the aluminum projects authorized is one in Arkansas, located not far from the bauxite deposits in that state. These deposits are of sufficient magnitude to supply raw material for a number of years. Aluminum reduction works are measured by "pot lines," each group of electrolytic cells requiring be-

tween 30,000 and 35,000 kw, at about 90 per cent annual load factor. The Arkansas plant is to have four pot lines calling for about 130,000 kw, with additional power required for mining and refining. Power will be supplied from a station adjacent to the aluminum plant, together with assistance from pooled utilities—over transmission lines. An internal-combustion-engine installation includes eighteen 2500-kw gas-burning Diesels and fifty smaller straight gas engines, a total of 68 engines, each driving a direct-current generator; conversion of energy from alternating to direct current is thereby avoided. This will be an unusual power installation, and quite economical from the thermal standpoint, the full Diesels doing 11,000 to 12,000 Btu per kwhr and the others about 15,000. The total gas-engine-electric installation will be 82,500 kw, designed to turn out 65,000 kw for two pot lines, with large allowances for maintenance outages and for reserve. The gas-engine units were obtainable on earlier shipments than steam equipment.

POWER RESOURCES FOR WAR LOAD

There have been considerable reductions in power and energy loads, in many parts of the country, resulting from dislocation of normal activities; many industries have swung over, in large measure, to war production. The magnitude of load shrinkage is usually difficult to estimate, exceeded as it usually is by the war increment. Blackouts are so far a minor influence, but dimouts along the coast are sometimes, as in New York City, responsible for substantial reduction in load and revenue. Curtailment of nonessential loads may be ordered by the Government when considered advisable, under W.P.B. Limitation Order L-94 of May, 1942. Shrinkage or curtailment of normal load of course results in corresponding release of capacity for war purposes.

There are many ways to augment the power or energy capability of electric systems. The major methods available to private utilities are as follows:

1 Shaping of loads: Normal and in some cases war loads are capable of manipulation to reduce system peaks; with existing load-demand curves, a large portion of energy-production capacity is unused; and whenever practicable to spread power requirements over longer hours; by staggering and shaping loads and by other means, large gains may be made.

2 Extension or improvement of transmission and distribution systems: Perhaps 20,000 miles of transmission lines have been built during the past 3 years; calculating-board studies offer a short-cut means for determining system characteristics and prescribing improvements; losses may be reduced by rearrangement or reinforcement of circuits, or by raising the power factor with static capacitors or condensers; output of transformers may be increased by judicious overloading and by use of blowers; higher system loads may be carried under tolerable conditions by installation of voltage regulators, circuit-protective equipment, and by other means.

3 Improvements in dispatching of generating stations and in scheduling of maintenance outages: A system containing both thermal and storage-type hydroelectric plants is particularly susceptible to alteration of scheduling, to increase availability of power or energy; staggering overhauls of interconnected-system units and extending periods between maintenance outages may materially raise capacity available during peaks.

4 Improvements to existing generating stations: Among the expedients are raising of steam pressure—if boiler design permits supplying of additional steam to give full turbine output by improvements to steam-generating plant—perhaps by conversion to another fuel permitting higher output, and installing minor equipment; a skilled plant-betterment force can do much toward increasing output and reliability, as well as improving efficiency of existing stations; conservation of fuel may become of importance in economizing rail and other transportation facilities.

5 Construction of new thermal power plants, or extension of existing: Most of the new utility installations are steam, practically all hydroelectric development now being undertaken by Federal or other public authority; of perhaps 5,000,000 kw (equivalent) of Diesel engines to be turned out in 1942, a very small percentage goes to utility plants.

6 Interconnection with neighboring utilities, enabling purchase or interchange of power, or co-ordination by means of an arrangement such as a "power pool."

7 Interconnection with industrial and municipal power stations, and purchase of power therefrom: A study was made recently, to indicate magnitude of power that might be made available by connection of these plants with utility distribution or transmission lines; a gross figure of 3,000,000 kw, as obtainable by these means was derived, but this may be scaled down for various reasons; 1,000,000 to 2,000,000 kw from these sources would mean a substantial addition to power resources in many parts of the country.

8 Purchase of power from Government developments: Examples of purchase from public power developments include a contract negotiated in 1937, by an Arkansas utility company to buy 40,000 kw from T.V.A., one by north Texas companies to purchase 45,000 kw from Lower Colorado River Authority, and one by a group of Arizona corporations to take 75,000 kw from Parker Dam on the Colorado River.

NEW STEAM-PLANT CAPACITY

The fundamental method of obtaining additional system capability is by the construction of additional plant. As stated before, the W.P.B. release of August, 1942, cited projects, for completion up to 1944 or 1945, including those originally approved and now canceled or postponed, aggregating nearly 10,000,000 kw. Of this, roughly one half was in hydroelectric and steam construction by public agencies, and the other half largely in steam projects of private utilities.

As examples of the latter, reference may be made to power developments on a group of properties for which the writer's employer, a utility service company, acts as consultant. On these properties, something over 400,000 kw in steam stations has been authorized during the past two or three years, intended for operation from early 1941 to the close of 1943. Projects are 14 in number, averaging about 30,000 kw each; this indicates the moderate size of steam installations in the smaller cities and scattered territories, in contrast with large metropolitan developments. Included are three extensions to existing low-pressure plants, three designed for 650 psi 825 F, six for 850 and 900, and two for 1250 and 925. All are condensing installations, except the two 1250-psi plants, which are superposed. Of these 14 projects, two have been suspended under orders from W.P.B.

Whenever character of installation permits, but one boiler per turbine is provided. As many of the developments are located in the lower Mississippi Valley and in the Southwest, natural gas will be the fuel for a large majority. One important installation includes two 350,000-lb per hr 1300-psi steam generators, to utilize anthracite fines from mines and culm piles, in the pulverized form. Over one half of the 14 installations require artificial cooling for condensing water, by extended circulation or by cooling towers or pond.

Except on projects constituting extensions to existing stations, all boilers are designed for outdoor or semioutdoor installation, usually with forced- and induced-draft fans placed outdoors. Four of the most recent designs, averaging 30,000 kw in capacity, incorporate semioutdoor turbines, the machine being placed on an open deck, with a small light removable structure protecting it from the weather, and served by a gantry

crane overhead. Miscellaneous equipment is housed as required. Plant staff is protected from the weather in performing most operating functions.

This type of semioutdoor installation, reducing station structures to the minimum, is still considered radical by most engineers. It has, however, proved itself, particularly with respect to boiler plant, by years of operation in various parts of the country, ranging from Florida and Texas in the South to Nebraska, Utah, and California in the West. Semioutdoor construction should be given careful consideration by plant designers of today, for the economies in investment, and, particularly at the present time, for the saving in structural steel and other critical materials. Hydroelectric installations with generators placed outdoors or lightly housed have been utilized for over 25 years, and these have seen several hundred plant-years of successful operation. Thirty years ago, outdoor installation of high-voltage transformers and circuit breakers was considered by most engineers to be impracticable, but today this is usual practice.

Mention has been made in the press of the Defense Plant Corporation's floating power plants, of which four are under construction. These each include a 30,000-kw 825-psi 900-F turbine, with steam generators laid out for use of oil fuel or natural gas. Estimated thermal economy is better than 12,000 Btu per net kwhr. Transformers are included for delivering a range of voltages from 66 up to 138 kv. The difficulties of design are considerable, with the required low head room and general compactness. It is understood that these floating plants are intended for mooring along the Great Lakes, Mississippi Valley, or Gulf Coast, the hulls being designed for a draft of about 8 ft, with 10 ft depth required when operating. W.P.B. is obtaining information as to favorable locations for these barge plants. They may be leased to operating utilities, on some rental and operating-cost basis. Cost of the 30,000-kw barge plants has been estimated around $3,500,000 each. It is usually difficult to show assured justification for a large mobile plant, except during emergency conditions.

POWER POOLS

One of the methods mentioned, to provide additional power for war and other loads, is by co-ordination of neighboring utility systems. A recent article by H. B. Sargent[1] brings out that the War Production Board has charged the utility industry "with the responsibility for the co-ordination of all power facilities." This must be done in spite of the disintegration of holding-company groups, now in process. While physical and operating integration usually covers special areas, "the end result, for all practical purposes, will be a nationally co-ordinated and integrated system." Among results of integration are "increased ability to take advantage of load, reserve, overhaul-schedule, climatic, water-shed, and other diversities . . . ., effective use of surplus capacity . . . ., greatest economy of operation and maintenance of equipment . . . ., fullest conservation of fuel . . . ., maximum assurance against breakdowns and emergencies . . . ., minimum costs and use of critical materials in meeting load growth." Each group of pooled systems becomes in effect one operating property.

Formation of a pool, negotiation of interconnection contracts and arrangements, and successful operation constitute a major human as well as physical operation. Much education, throughout the personnel of companies participating, is required. Breadth of view and a spirit of cordial co-operation are requisites for success.

Power pools are spotted over the entire country; two examples with which the writer is familiar may be cited.

[1] "Regional-Integration," by H. B. Sargent, *Electrical World*, vol. 118, Aug. 22, 1942, pp. 51–52.

NORTHWEST POOL

There now exists in the Pacific Northwest, to quote from a report on the subject, "an interconnected network of systems embracing every important utility, both private and public, in the states of Utah, Idaho, most of Montana, Washington, and most of Oregon. This interconnected network, ... with the operating experience and co-operative spirit of the organizations, is an invaluable asset to the region under present circumstances. As a result, every assurance can be given that maximum combined power resources of the region are available for production of the great quantities of copper, zinc, aluminum, lead, other metals, chemicals, lumber, and agricultural products, and for many other industries vital to the war . . . . . The interconnected systems are predominantly hydroelectric and the energy or kilowatt-hour capability during low-water years determines the amount of load that can be carried . . . . . Early in 1941, with rapidly increasing war loads, threatened low-water conditions, and increase in number of systems interconnected, the companies formalized to a greater degree the operating organization. An operating committee was established, consisting of a responsible operating engineer from each company to co-ordinate the interconnected system or pool operations. This committee is assisted by a consulting staff including a co-ordinating, a hydraulic, and an electrical engineer."

Of the ten utilities co-operating, including Bonneville Administration and two municipals, six are clients of the service company with which the writer is connected. These six companies, with properties in Oregon, Washington, Montana, Idaho, and Utah, have been partially interconnected for years, and such connection was completed in 1940 by the construction of a 300-mile 154-kv line from Butte, Montana, to northern Utah. Since that time, the other four utilities have entered into the co-operative agreement. The result of this co-ordination has been an increase in combined capability of the group of systems of between 50,000 and 100,000 kw. Important in this case is the ability to store steam-generated energy in reservoirs for future use. As an example, Utah can store steam-generated energy in its Bear Lake reservoir, with total storage capacity approaching 1,000,000,000 kwhr, or more remotely in one of the Montana reservoirs.

The pool area, about 1000 miles across in maximum dimension, is divided into five major load districts. To keep the entire operating committee informed of the status of all companies, daily reports are sent from each district to each member of the operating committee and to the co-ordinating group, giving actual loads, generation by sources, interchange transactions of received and delivered power, stream-flow conditions, status of reservoirs, and precipitation data.

Weekly telephone conferences are held, with members of the operating committee connected in. Monthly meetings are also held, of operating committee and co-ordinating group members, to discuss important phases of power interchange and to determine any new policies required.

Detailed schedules are prepared, covering one week in advance, specifying just how much power is to come from each source, from hour to hour. This schedule is followed by pool participants, in so far as capacities actually available, and loads experienced accord with forecasts. If the schedule cannot be adhered to, the power commitment is passed on to the next less economical source, relative economy of all sources being established in advance. Little consideration is given to ownership of resources or to usual allocation of customers.

Modern automatic transmission-control devices, including particularly load controls, are of course utilized. For telemetering, control, and communication, carrier current is largely used.

A typical load-duration curve, plotted to indicate estimated apportionment of energy from each source, shows for February, 1943, a peak load of 2,400,000 kw, with 1,300,000,000 kwhr total energy. Energy blocks in order of magnitude, under the duration curve, are as follows: Uncontrollable river flow and storage; steam-plant output; controllable storage; purchases. Estimated hydroelectric-energy availability is based on low-water conditions. Surplus steam energy available but not required for estimated load is shown as averaging about 50,000 kw, or 2 per cent of maximum load; this indicates the necessity for close scheduling of available energy in the area.

There will be little surplus capacity, if low-water conditions prevail, but it is now quite assured that Pacific Northwest loads can be carried through 1942; similar adequacy is expected in 1943. This result has been achieved largely by the integration of resources, including all private and municipal utility plants and the large capacity installed by the United States at Bonneville and Grand Coulee.

SOUTHWEST POOL

The Southwest Power Pool was created with the objective of providing maximum power and energy, particularly for aluminum production in central Arkansas. The pool, as now constituted, is operated primarily for drainage of power surplus from states adjoining Arkansas, rather than for full co-ordination of systems. The utility companies in the Southwest have for some time created their own area pools, and this larger group is a combination of the northern four of these.

In May, 1941, the Arkansas Power & Light Company was informed that an aluminum plant was projected for that state, and a start was at once made in organizing to meet power demand. Co-operation was solicited from neighboring utilities, resulting in a combination of 14 power companies. Power resource aggregating between 1,000,000 and 1,500,000 kw were pooled, and construction of necessary interconnection reinforcements undertaken. The problem was to supply temporary emergency power to the aluminum load, pending the building by the Defense Plant Corporation of a power station of its own adjacent to the aluminum reduction plant.

The Defense Plant Corporation contracted with Arkansas Power & Light to supply power from the pool, for aluminum-plant requirements, and Southwest pool co-ordination work was completed in ample time to deliver the full power contracted for. The Defense Plant Corporation also arranged with Ark-La Electric Cooperative (a corporation related to Rural Electrification Authority) for a partial power supply, and Ark-La built a 200-mile transmission line from the hydroelectric development of the Grand River Dam Authority in Oklahoma, direct to the aluminum plant. Two of the four pot lines of the aluminum reduction plant are now in operation, with part of the load requirements supplied by the Southwest pool and part by Ark-La.

As to the Northwest pool, there is an operating committee and a technical group, the latter devoting its entire time to pool operation. Procedure and objectives are similar in the two pools discussed, varying only as to power sources and physical conditions and relations. In the Southwest Power Pool, steam is by far the prevailing source of energy, and each steam plant is analyzed in detail, economies figured, and Willans lines drawn, determining cost of output from no load up to full load on each station. These data are prepared in a form convenient for use in scheduling plants from hour to hour.

In both pools mentioned, past experience and ability of private utilities in interconnected operation come into full play in guiding and carrying on the operations.

UTILITY-COMPANY CONTRIBUTION TO WAR POWER

It is realized that this paper has by no means covered all possibilities of adding to power capability. Objectives of utility companies are in general to provide power when called for, with minimum use of critical materials. Simplification is in order, and refinement and reserves ordinarily thought necessary may frequently be eliminated.

It is obvious that electric and other utilities are passing through a difficult period. While energy output is running between 12 and 15 per cent above 1941, net income may be from 15 to 20 per cent down, on the average. Nevertheless, few of the important industries are as well prepared to meet the demands as is the electric-utility group. Still more would be done were more equipment available. One of the greatest contributions of power utilities has been to work out full utilization of existing facilities. The plants that were in operation before the beginning of the war have had to carry and will continue to carry the major part of the war load. This has in many cases included heavy industrial loads, such as for chemical and metallurgical processes, that in the past have been carried by power-generation facilities of the industries in question.

The performance of the electric light and power industry, in meeting fully and on time the large and unexpected war loads, superimposed on normal peacetime loads, is outstanding. This country has been a pioneer in interconnection of facilities and pooling of power-generating capacity over wide areas, making possible better service and, at the same time, bringing large economies in both capital investment and operating costs; these have been reflected in steadily declining prices for electric service. Delegations from other countries visited the United States to study this development, and the plans for the so-called British Grid, which has proved so necessary in meeting war loads in the British Isles, were based largely on the pioneering work along these lines by utility companies, electrical manufacturers, and others in this country.

The results of that enterprise are proving of incalculable value to the country in its war-production program. In fact, it is difficult to see how such a program could have been carried out in time to meet the nation's needs but for this and the other achievements of the industry over a period of years. The net result today is, as said before, that while the country has been and is short of almost everything else, no necessary war load has lacked electric power. This condition has obtained in spite of the continuous attack on the utility industry.

It would be a welcome development if governmental efforts directed to reform and to radical modification of existing corporate structures could be postponed until after the war. Though utility and industrial companies are struggling with important war problems, handicapped by depleted personnel, the time of executives, lawyers, engineers, and accountants must be diverted to compilation of reports and other presentations to governmental authorities, and to the preparation for and attendance on hearings. Such work is useless as contributing toward winning the war and substantially hinders essential activities.

Considering the complexities of present-day life and its activities, competent agencies must be established to administer the great mass of statutes enacted. The administrative bodies set up frequently combine the functions of investigator, prosecutor, judge, and jury, with legislative functions in addition, as they develop a body of administrative law. There is prime need for selection of experienced and judicially minded men for these offices. By no other means can reasonable interpretation and application of legistative intent be achieved.

Drilling DEEP HOLES *in* MAGNESIUM ALLOYS

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THE drilling of deep holes in metals is often accompanied by difficulties. Poor surface finish is likely to be produced, and it is sometimes necessary to withdraw the drill frequently to clear chips from the flutes. These difficulties are not common to magnesium alloys alone but also occur in the deep-drilling of other nonferrous alloys, cast iron, and steel.

A study of the literature discloses that many types of drills have been recommended for use on magnesium alloys (1, 2, 3).[1] This paper is intended to supplement the available data, to find reasons for reported discrepancies, and to report some original research on the problem.

It is generally conceded that, when drilling deep holes in any metal, special drills are necessary to prevent clogging of chips and subsequent binding of the drill in the hole. For shallow holes, many types of drills will function satisfactorily, but improvements may be made by using a correctly designed drill. In an article published in 1937 (4), it was recommended that drills for magnesium alloys should have large chip spaces, polished flutes, small point angles, and small helix angles. It was recommended that a 15-deg-helix drill be used with narrow lands and wide polished flutes but ground with a 90-deg point angle. Standard drills produced unfavorable chip formation and subsequent clogging of the flutes in holes whose depths were more than six times the drill diameter. A theory was advanced that the use of a 0-deg helix angle would give less resistance to chip flow and would, therefore, help with chip disposal.

Another article in the literature (5) recommends higher helix angles for deep holes, with the stipulation that the chip formation for these holes should be continuous coils and not short broken chips. This requires the use of small feeds in the range of 0.005 in. per revolution with speeds of 650 to 1000 fpm for high-speed-steel drills and speeds of 500 to 650 fpm for carbon-tool-steel drills. When using drill bushings, it is necessary to reduce the speeds to approximately 300 fpm.

In a very complete article on drilling by Lingemann (6), the use of helix angles of 12 to 25 deg was recommended for shallow holes where it was possible to use feeds up to 0.02 in. per revolution. When drilling deep holes, it was desirable to use helix angles of 36 to 45 deg to facilitate chip disposal. These deep-hole drills should have a constant web thickness along their length and be operated at feeds up to 0.008 in. In this series of tests a drill press capable of 20,000 rpm was used, which allowed cutting speeds of 2000 fpm, with no apparent dulling of the tools. The high-helix drills often produced irregular and out-of-round holes, but this difficulty was eliminated by the grinding of a "center point" on the drill which, when correctly ground, produced straight, smooth, and accurate holes. Special combination drills were manufactured with a low helix angle at the point of the drill to produce good surface finish and round holes; and a high helix angle at the back of the drill for good removal of the chips from deep holes.

OBJECT OF EXPERIMENTS

The survey of the literature indicated that deep holes could be satisfactorily drilled in magnesium alloys, but little information was available on the accuracy of the holes that are produced, the power that is required for drilling, or the best

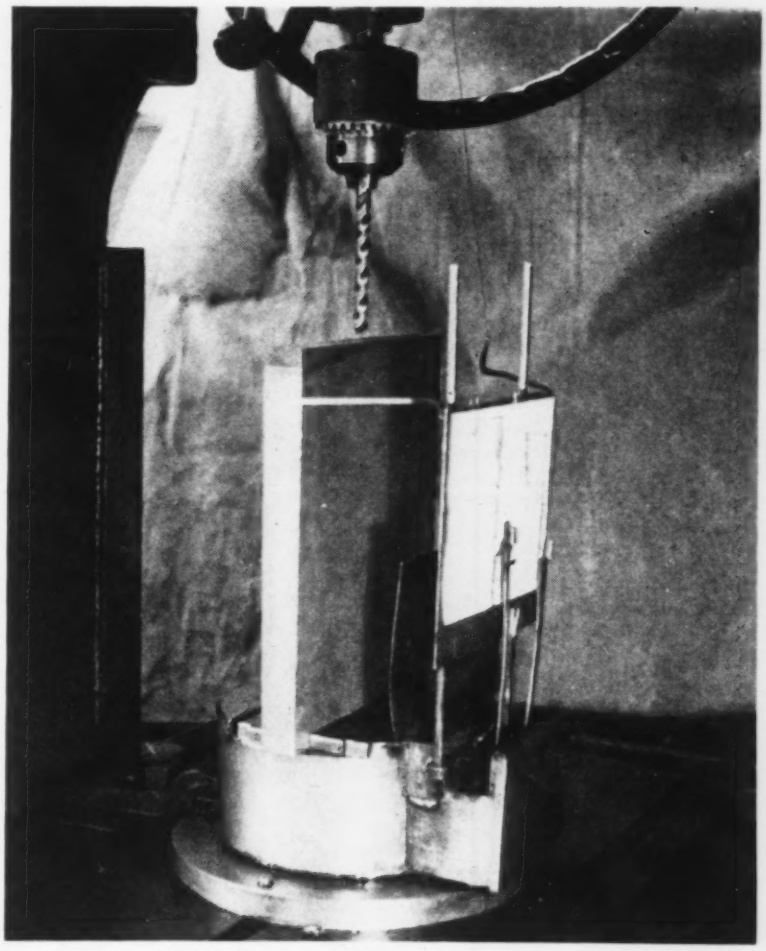


FIG. 1 EQUIPMENT SETUP USED IN DRILLING TESTS

[1] Numbers in parentheses refer to the Bibliography at the end of the paper.

Contributed by the Production Engineering Division for presentation at the Annual Meeting, New York, N. Y., Nov. 30–Dec. 4, 1942, of THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS.

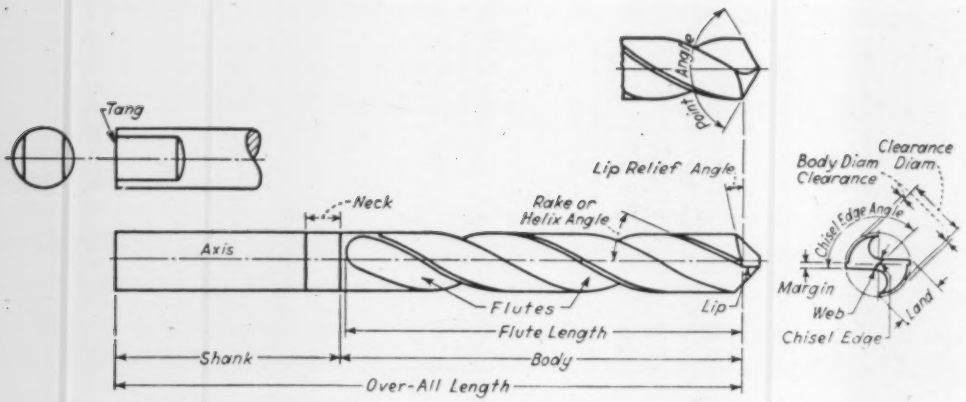


FIG. 2 NOMENCLATURE FOR TWIST DRILLS (As given by American Standards Association.)

way in which to alter standard drills in order to improve their performance.

These experiments were made to determine which type drills and drilling techniques were best suited for deep-hole drilling in magnesium alloys. Difficulties or inaccuracies in drilling, which were reported in the literature and encountered in preliminary tests, were used as a basis from which to evaluate the performance of the drills. These factors were:

1 Accuracy of drilled hole.
   (*a*) Size.
   (*b*) Roundness.
   (*c*) Straightness.
2 Surface finish.
3 Chip disposal.
4 Torque and thrust.
   (*a*) Clogging of chips.
   (*b*) Binding; undersized hole.
   (*c*) Binding; crooked or spiraled holes.

EQUIPMENT USED FOR EXPERIMENTS

The machine tool used for these drill experiments consisted of a Barnes geared-head toolroom drill press with power feeds of 0.004 to 0.031 in. and speeds from 143 to 1415 rpm. A small spring-loaded dynamometer was used to measure and graphically record the torque and thrust. All of the tests were run on 2 × 10 × 12-in. chill-cast blocks of Dowmetal H alloy (Mg + 6 per cent Al + 0.2 per cent Mn + 3 per cent Zn). Two sizes of drills, $^{5}/_{32}$ in. and $^{1}/_{2}$ in. diam, having helix angles varying from 0 (straight-fluted) to 45 deg, were used. The following drill elements were varied in these tests:

1 Helix angle.
2 Drill points.
3 Condition and size of drill flutes.

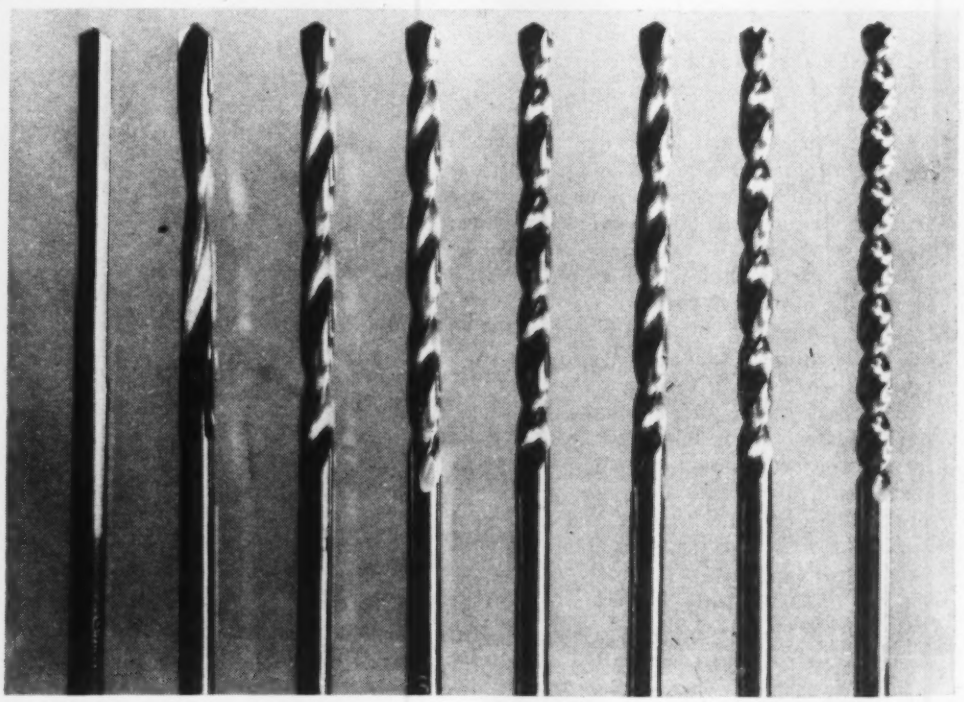
Two types of cutting fluids which were tested for their effect on deep-hole drilling were commercial-grade kerosene and a light mineral-oil-base fluid with a viscosity of approximately 50 sec Saybolt.

METHOD OF TEST

The drilling tests were made by clamping the magnesium test blocks in the drill dynamometer, as shown in Fig. 1, and drilling test holes to a maximum depth of 10 in. During the drilling operation the torques and thrusts were graphically recorded, showing the operation of the drill as affected by the depth of hole. The formation and disposal of the chips were observed during the drilling process and a further study made after drilling by cutting open the test blocks and inspecting the holes for straightness, roundness, surface finish, and size. The variables which were independently tested for both the $^{5}/_{32}$ and $^{1}/_{2}$-in-diam drills were:

1 Cutting speed or revolutions per minute of the drill.
2 Feed, inches per revolution.
3 Design of the drill.
4 Effect of cutting fluids

The nomenclature used throughout the paper to designate various parts of a drill is explained by the diagram, Fig. 2.



0° 10° 22° 26° 28° 30° 35° 45°

FIG. 3 DRILLS OF $^{5}/_{32}$-IN. DIAM WITH VARYING HELIX ANGLES USED IN EXPERIMENTAL TESTS

RESULTS OF 5/32-IN-DIAM DRILLING TESTS

The 5/32-in-diam drills were used to drill to a depth of 1 1/2 in. which produced a hole whose length was approximately 10 times the diameter. By making readings of the torque and thrust at various depths, the performance of the drills was observed under conditions simulating both shallow and deep holes. The dividing line between shallow and deep holes was taken as a point at which the depth of the hole was 5 times the diameter of the drill. The drills with helix angles of 0, 10, 22, 26, 28, 30, 35, and 45 deg are shown in Fig. 3. These drills were tested first with the flutes not polished and then later tested after the flutes had been polished and opened up, as indicated in Fig. 4. The effects of such variables as helix angle, cutting speed, feeds, and condition of the drill flutes on the torque developed are shown by the curves in Figs. 5 and 6.

Effect of Helix Angle. In Fig. 5, the results are given for dril's with helix angles from 0 to 45 deg whose flutes are not polished (representing the drills that might be used commercially on other materials). These drills were tested at speeds of 573 and 1415 rpm, and at feeds of 0.004 in. and 0.006 in. For shallow holes, where the depth of hole was less than 5 times the diameter of the drill, the helix angle had very little effect on torque. This is shown graphically by the curves representing the 1/8 and 1/2-in-depth holes. There was a slight reduction in torque as the helix angle was increased and no serious chip interference up to 1/2 in. depth of hole. The drills having 10 to 20-deg helix angles gave the best all-around results for shallow-hole drilling. The holes were close to size, round, straight, and had good surface finish. When the depth of hole increased to 1 in., however, considerable difficulty was experienced with the low-helix drills, in that the chips clogged in the flutes and produced excessive torques. For the 0-deg-helix drill, the torque increased from approximately 0.3 lb-ft up to 2.2 lb-ft as the depth of hole increased from 1/2 to 1 in. depth. Only the high-helix-angle drills having angles of 45 deg proved satisfactory for deeper holes. Standard drills having a normal 30-deg helix angle would in some cases penetrate to 1 1/2 in. depth but in all cases gave serious chip interference. In general, the helix angle is not important for shallow holes but should be increased to 45 deg when drilling deep holes. These same general results were also observed for the drills with polished flutes.

The surface finish of the holes was affected by the helix angle. Drills having a large helix angle of 45 deg produced a slightly spiraled hole, whereas drills having a 10-deg helix angle produced a smooth accurate hole but could be used only for drilling shallow holes.

Effect of Polishing Flutes. In Fig. 6 are shown the results of a series of tests, in which the drill flutes were polished. For shallow holes, polishing of flutes had only a very slight effect on torque. For deep holes the polished flutes were very beneficial for drills having helix angles up to 35 deg. The larger flutes allowed the chips to flow more easily causing less interference and less increase in torque.

With fine feeds, the 45-deg-helix drills did not benefit by having the flutes opened up or polished, due to the fact that long stringy chips were formed which did not tend to jam in the flutes. If heavy feeds are used, the chip will be broken up and the opened and polished flutes will prove beneficial.

Effect of Varying Feed. A drill of 5/32 in. diam is normally operated at a feed of approximately 0.004 in. in drilling most metals. As shown in Figs. 5 and 6, higher feeds of 0.006 in. cause no difficulties when drilling shallow holes in magnesium alloys. Experimental tests were conducted by drilling thin plates, using feeds as high as 0.031 in. without causing any difficulties. Deep holes could not be drilled using these heavy feeds as the chips would clog in the drill flutes. Slower speeds and polished flutes allowed the use of heavier feeds with lower torque. However, in the range of speeds tested, the drilling speed had little effect upon the performance of the drills.

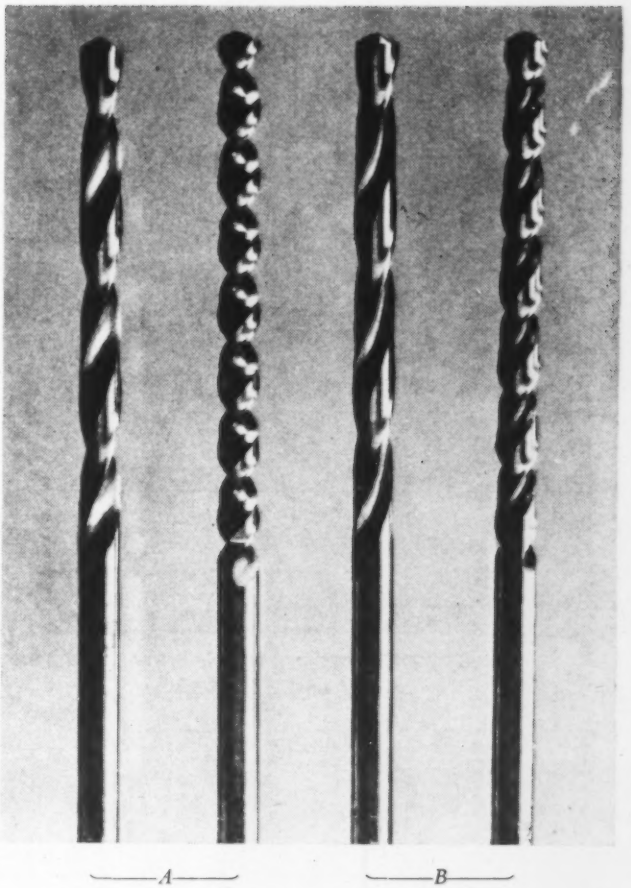


FIG. 4 DRILLS OF 5/32-IN. DIAM WITH OPENED AND POLISHED FLUTES *A*, AND STANDARD FLUTES *B*

Smaller feeds in the range of 0.004 in. should be used for deep holes, even when using 45-deg-helix-angle drills. This allows the chip to be long and straight, feeding itself out through the flutes, whereas if the feeds were increased to 0.006 in. or higher the chips would break and clog the flutes of the drill.

SUMMARY OF DRILLING TESTS USING 5/32-IN. DRILLS

Shallow Holes. The results of the drilling tests with 5/32-in-diam drills indicate that, for shallow holes, the torque is not seriously affected by the helix angle. Feeds of 0.006 in. and higher are permissible but naturally will cause an increase in torque. Polishing or opening up of the flutes is somewhat beneficial and is recommended even for shallow holes.

Deep Holes. For deep holes, drills having a 45-deg helix give the most satisfactory performance. Polishing of the flutes is not necessary but is generally recommended. Feeds up to 0.006 in. may be used, although the smaller feeds of 0.004 in. give less chip interference. The surface finish of the holes is best when using drills having approximately a 10-deg helix angle. Torque values do not vary much with the speed of drilling but the higher speeds give slightly better surface finish besides greatly reducing machining time.

Because of the difficulty in grinding special points and various point angles on small drills, the effect of variables such as point angles, chisel-edge angles, and special points was not investigated in the series on 5/32-in-diam drills. The tests were conducted using standard points and point angles, in an

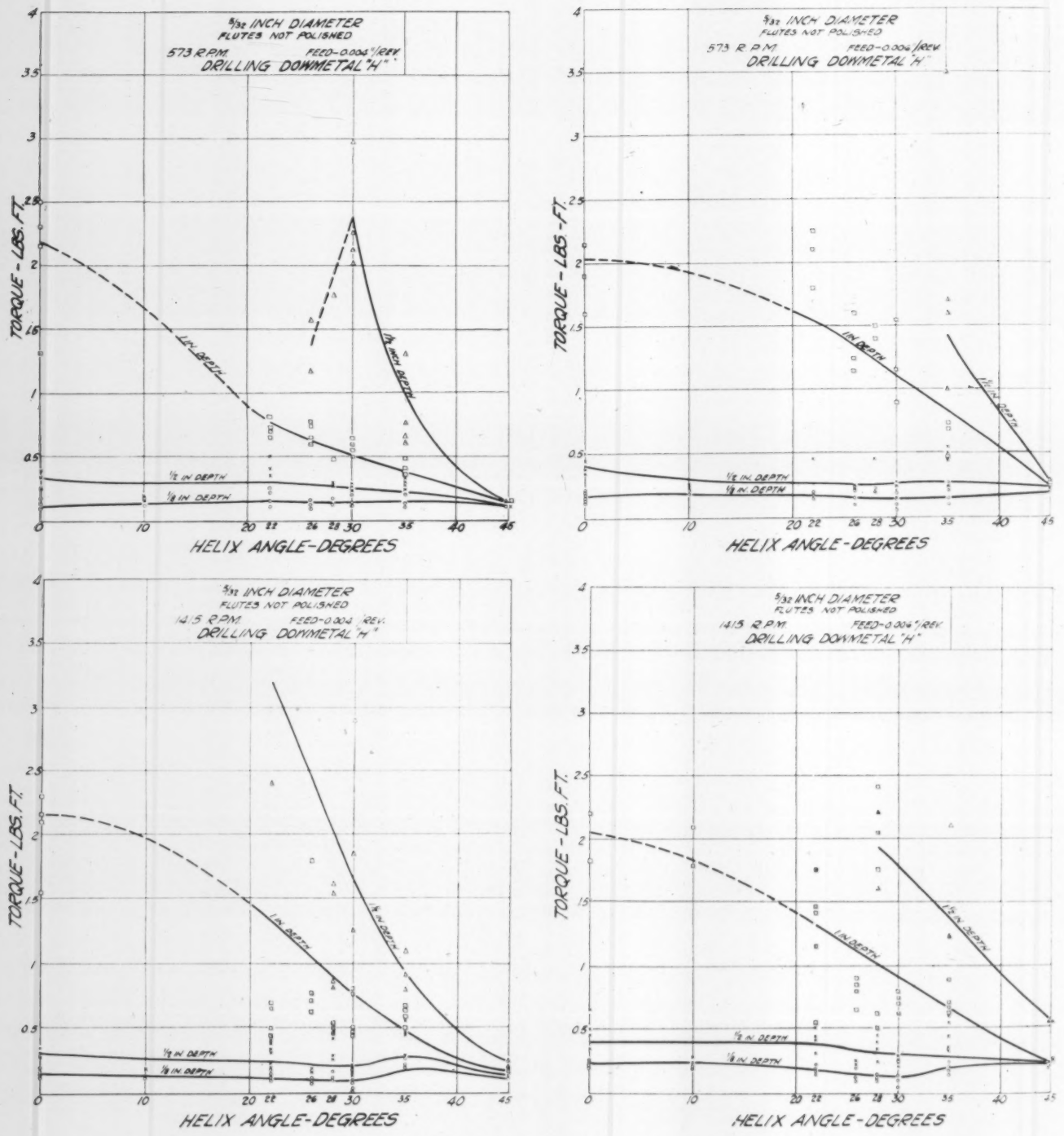


FIG. 5 CURVES SHOWING TORQUE DEVELOPED BY STANDARD-FLUTE DRILLS WITH VARIOUS HELIX ANGLES

attempt to find the proper conditions for the use of standard drills. The tests, using the $^1/_2$-in-diam drills, showed the extreme importance of drill-point design on the quality of the hole produced and the torque developed. This apparently explains the observed discrepancies in the results from the tests on the two sizes of drills.

RESULTS OF TESTS WITH $^1/_2$-IN-DIAM DRILLS

The results of the $^5/_{32}$-in-diam-drill tests were verified by a second series of tests made with $^1/_2$-in-diam drills. These drills were made especially for deep-hole drilling with a flute length of 10 in., a total length of 12 in., and a web with a constant thickness from the point to the back of the drill. Five drills having helix angles of 0, 10, 20, 30, and 40 deg were tested. The variables investigated for these larger-sized drills were:

1 Helix angle.
2 Drill pointing.
   (*a*) Chisel-edge angle.
   (*b*) Point angle.
   (*c*) Special points.
3 Feeds.

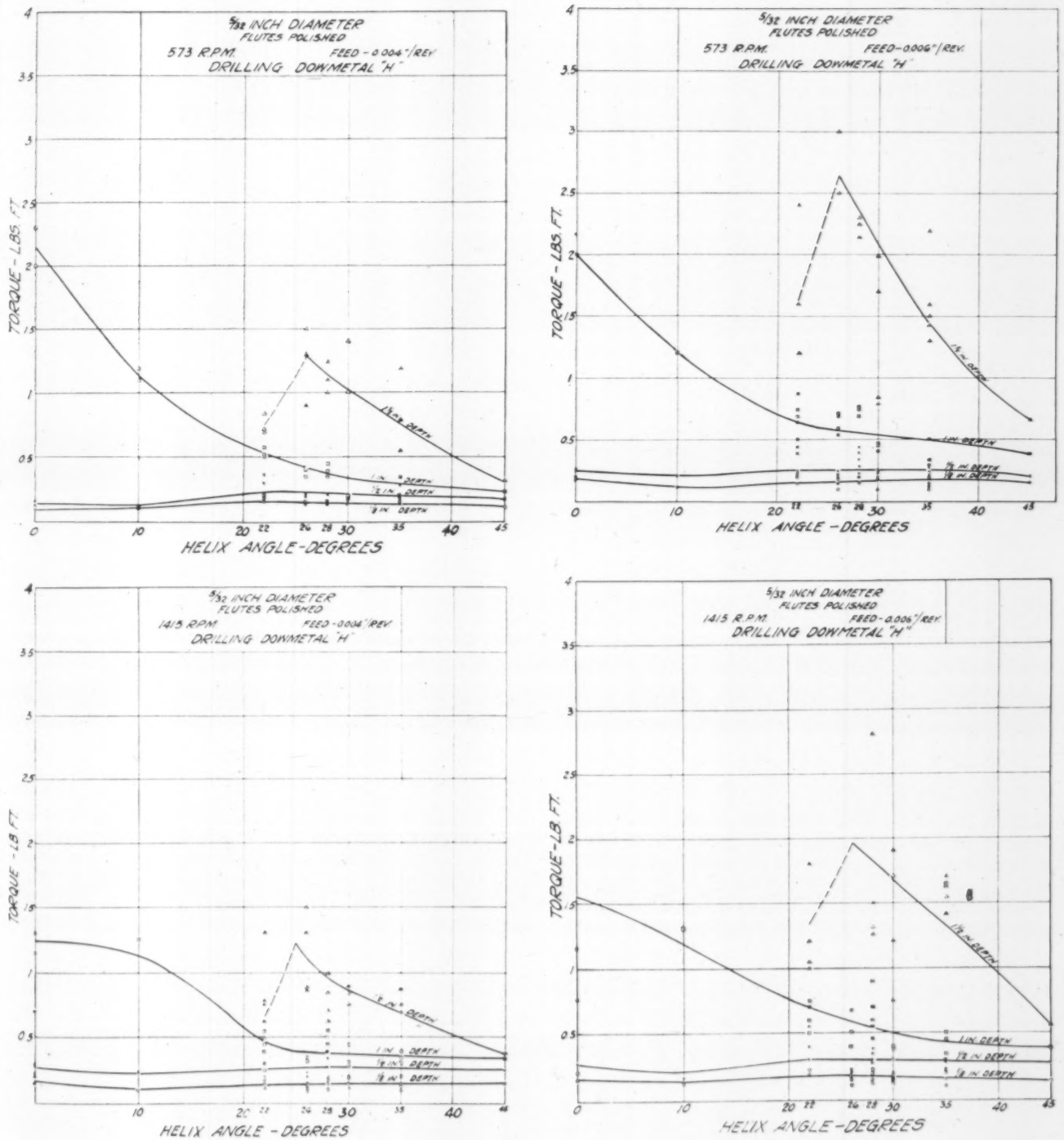


FIG. 6 CURVES SHOWING TORQUE DEVELOPED OPEN-FLUTED BY DRILLS WITH VARIOUS HELIX ANGLES

4 Speeds.
5 Fluted polishing.
6 Enlarging of flute space.
7 Cutting fluids.

Test data were obtained on the torque and thrust, the surface finish, the size of hole, and the chip formation and disposal.

Effect of Helix Angle. When drilling deep holes in magnesium alloys, it is essential that the proper helix angles be used if high production and accurate holes are to be obtained. The results of drilling tests with various-helix-angle drills are shown in Fig. 7. The block was cut open after drilling to observe the size, straightness, and surface finish of the holes. These tests were run at a speed of 184 fpm (1415 rpm) and a feed of 0.009 in. per revolution, with drills having a 118-deg point angle and a 135-deg chisel-edge angle. The 0, 10, and 20-deg-helix-angle drills gave badly spiraled holes; the 30-deg-helix drill performed fairly well at shallow depths but gave an irregular and spiral hole as the depth increased; and the 40-deg-helix drill gave a very good hole with the exception of a slight spiral at the top. A spiral hole binds on the drill and, if the spiraling is severe, makes it difficult to ream the surface to a smooth accurate hole.

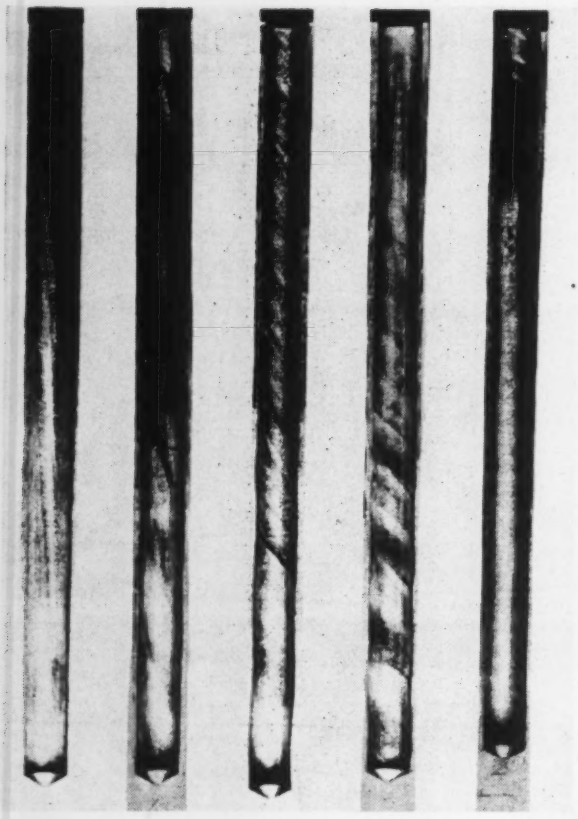


FIG. 7 SECTIONAL VIEW OF $^1/_2$-IN-DIAM HOLES, SHOWING EFFECT OF HELIX ANGLE ON QUALITY OF HOLES DRILLED AT 1415 RPM, 0.009-IN. FEED, WITH DRILLS HAVING A 135-DEG CHISEL-EDGE ANGLE

The conditions mentioned are illustrated graphically in Fig. 8, which presents graphs of the torque developed versus the depth of the drilled hole for various feeds, chisel-edge angles, and helix angles. These data were obtained by drilling $^1/_2$-in-diam holes at 1415 rpm, with 30 and 40-deg-helix-angle drills having polished and opened flutes. Comparison of the curves for the 30 and 40-deg-helix drills clearly shows the excessive torques developed by the 30-deg-helix drill at all except shallow depths. The evenness of the curves for the 40-deg-helix drills shows that there is a uniform cutting action with no jamming of chips or binding of the drill to cause abrupt changes in torque.

The curves in Fig. 9, show the range of torques developed at various depths of hole and different feeds for drills with helix angles from 0 to 40 deg. Increasing the feed produces higher torques. Comparison of the torque values at 6-in. and 9-in. depths at all feeds presents further evidence for recommending 40-deg-helix drills for deep-hole drilling. For shallow holes, with a depth less than 5 times the drill diameter, either 30 or 40-deg-helix drills with standard points will function satisfactorily as far as torque is concerned, but the maximum-quality surface finish will not be obtained. Helix angles less than 30 deg may be used but spiraling will probably be encountered, and the webs should not be thinned on low-helix-angle drills to insure round and accurate holes. Extremely thin webs and excessively large chisel-edge angles remove the center of the drill allowing the cutting edges to rotate about other than the true center of the drill and produce out-of-round holes.

Deep holes require the use of a 40-deg-helix-angle drill for ease in chip removal and production of true, accurate holes. With a drill of this type, accurate holes can be drilled to a depth of approximately 20 times the drill diameter. Feeds from 0.004 to 0.021 in. can be used with best results obtained with a feed of 0.014 in. Chip removal is sufficiently good with the 40-deg-helix drill so that these deep holes could be drilled without the necessity of withdrawing the drills to clear the chips. The high-helix-angle drills take advantage of the rotary motion of the drill to push or "screw" the chip up and out of the drill flutes, thus preventing jamming.

Effect of Drill Pointing; Chisel-Edge Angle. The chisel-edge angle had considerable effect upon the surface finish of the hole and the depth to which a drill penetrated before excessive clogging of the flutes occurred. The series of tests, represented in Fig. 10, was made with the $^1/_2$-in. drills having helix angles of 10 and 30 deg, using a speed of 1415 rpm and a feed of 0.014 in. The chisel-edge angles were ground by machine. Increasing the chisel-edge angle of the 10-deg-helix drill allowed a good depth of penetration, as may be seen in Fig. 10, but at the same time caused the hole to be more spiraled. Increasing the chisel-edge angle on the 30-deg-helix drill caused an improvement in surface finish of deep holes and allowed the drill to penetrate to 9 in. depth without excessive clogging of the flutes.

Since a large chisel-edge angle produces a large relief angle, and since large relief angles are necessary when using high rates of feed, the following general rules can be applied. When using high feeds, the chisel-edge angle should be increased to approximately 150 deg for drills having 40-deg helix angles. When using small feeds with drills having a low helix angle of 10 deg, the chisel-edge angle should be reduced to approximately 120 deg. Chisel-edge angles above 150 deg will cause an excessive length of the chisel edge with a resultant increase in torque and thrust.

Large relief angles or chisel-edge angles will not allow the drill to center itself with the result that an out-of-round hole is formed at the start of the cut.

Effect of Drill Point; Point Angle. The point angle of a drill influences the accuracy of the drilled hole. Shown in Fig. 11 are some of the miscellaneous drill points that were tested. These points varied from a flat point angle of 180 deg with a small spur point to a long point angle of 90 deg. A flat point of 180 deg, if used without a spur, will produce out-of-round and spiraled holes. The spur provides a center of rotation which prevents any sidewise motion of the drill and insures a round straight hole. If the spur is not of sufficient size, chips packing in the flutes may cause the cutting edges to rotate off-center and produce a spiraled hole as is shown in Fig. 11.

Decreasing the point angle or rounding the corners helps to center the drill and facilitates the production of smooth accurate holes of shallow depth. Rounding the corners or using long point angles is not advisable when drilling deep holes, because spiraling results from the improper chip formation and high lateral forces exerted by the drill point. For drilling deep holes the most satisfactory point angle is the 118-deg standard point.

High-helix-angle drills are more apt to cause objectionable spirals than the low-helix drills, but this can be overcome easily by modifying the 118-deg standard point with a spur point. Fig. 12(*A*) shows three holes drilled with a standard-pointed 40-deg-helix-angle $^1/_2$-in-diam drill at feeds of 0.009, 0.014, and 0.021 in. feed per revolution and 1415 rpm. The usual type of spiraling is very evident but is completely removed by adding a spur point to the same drill and operating it under identical conditions, as is shown in Fig. 12(*B*). This type of modification of the standard point is illustrated in Figs. 13 and 14. The spur must be in the center of the drill; otherwise, oversized holes will be obtained.

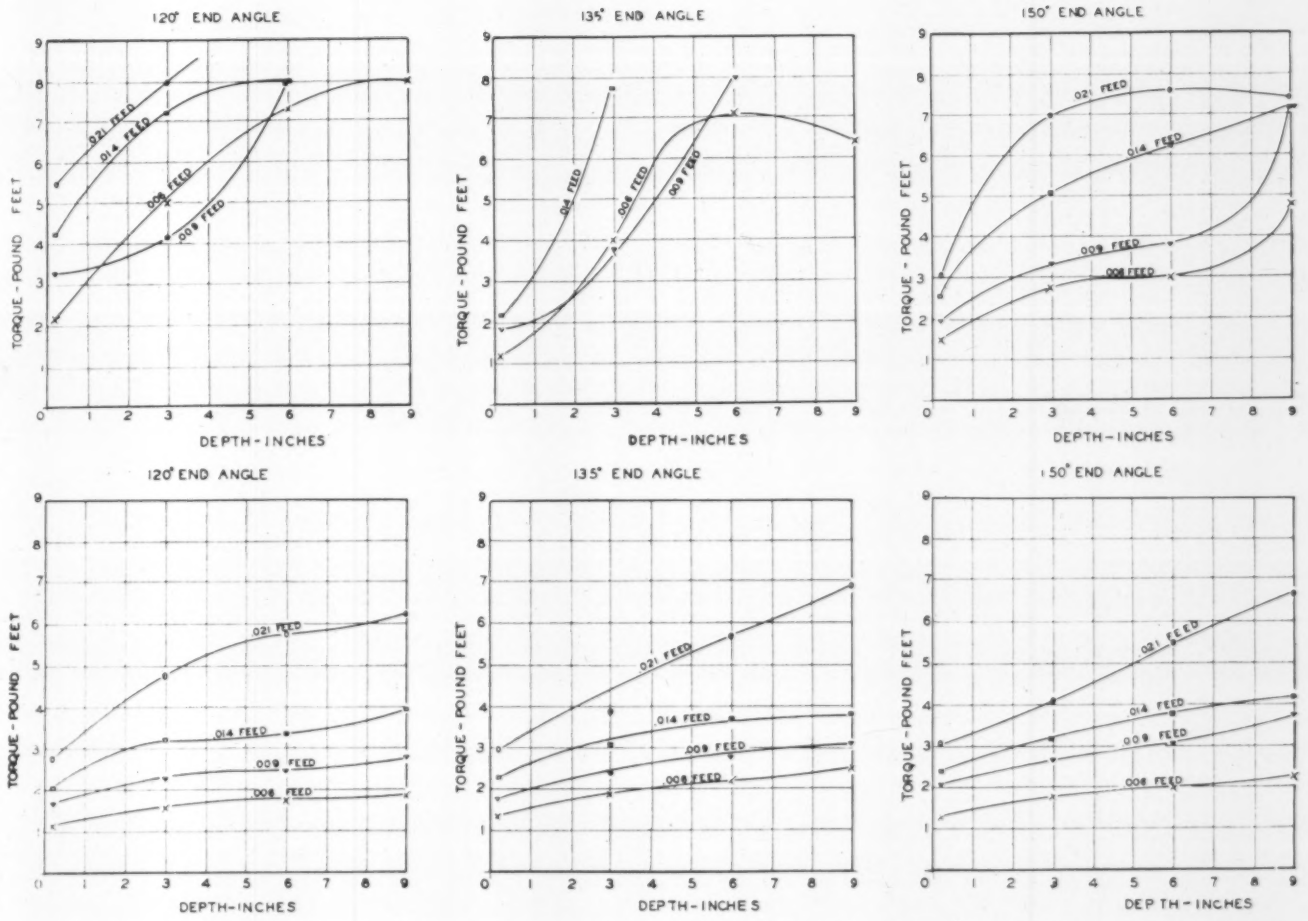


FIG. 8 CURVES SHOWING RELATION BETWEEN TORQUE AND DEPTH OF DRILLED HOLE FOR VARIOUS FEEDS AND CHISEL-EDGE ANGLES
(Polished-flute drills used with a cutting speed of 1415 rpm. Top row, 30 deg helix angle; bottom row, 40 deg.)

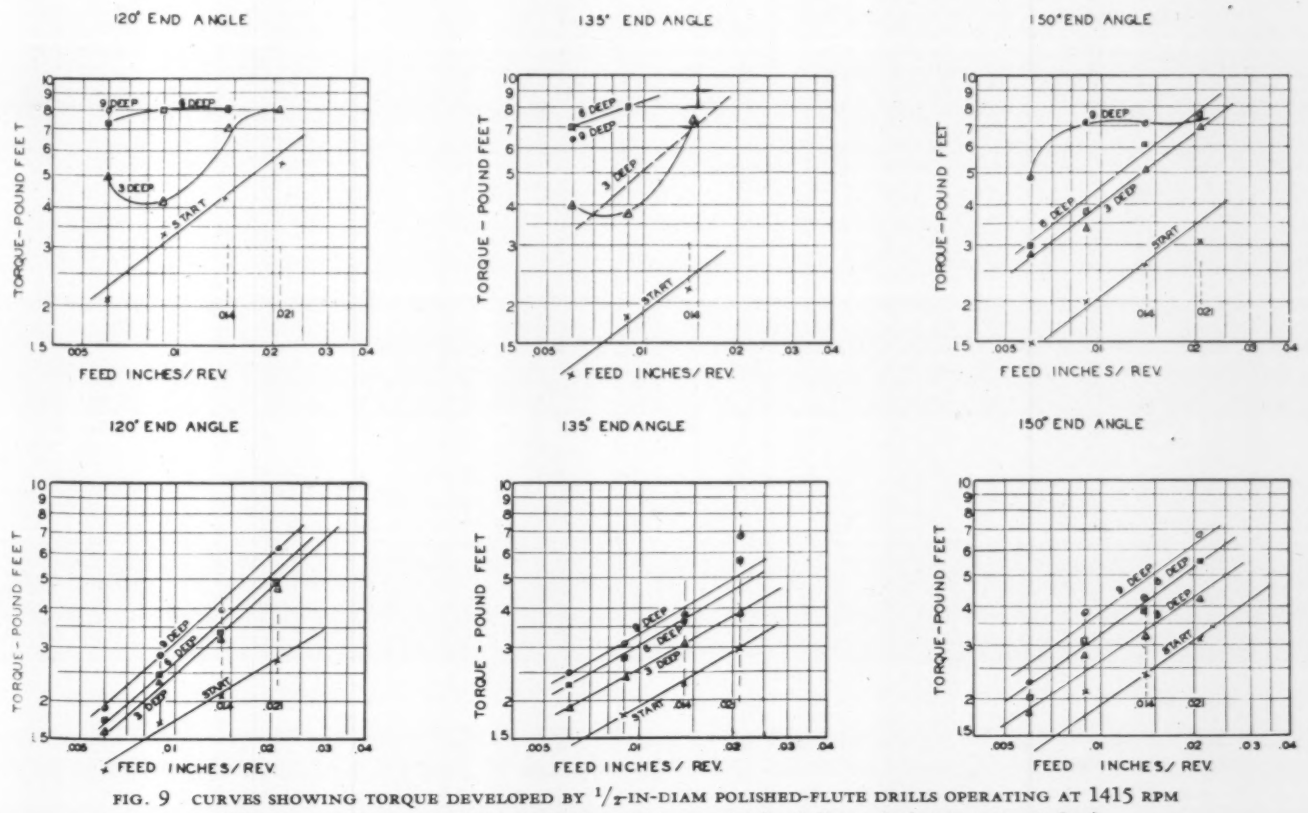


FIG. 9 CURVES SHOWING TORQUE DEVELOPED BY 1/2-IN-DIAM POLISHED-FLUTE DRILLS OPERATING AT 1415 RPM
(With various feeds and chisel-edge angles. Top row, 30-deg helix angle; bottom row, 40 deg.)

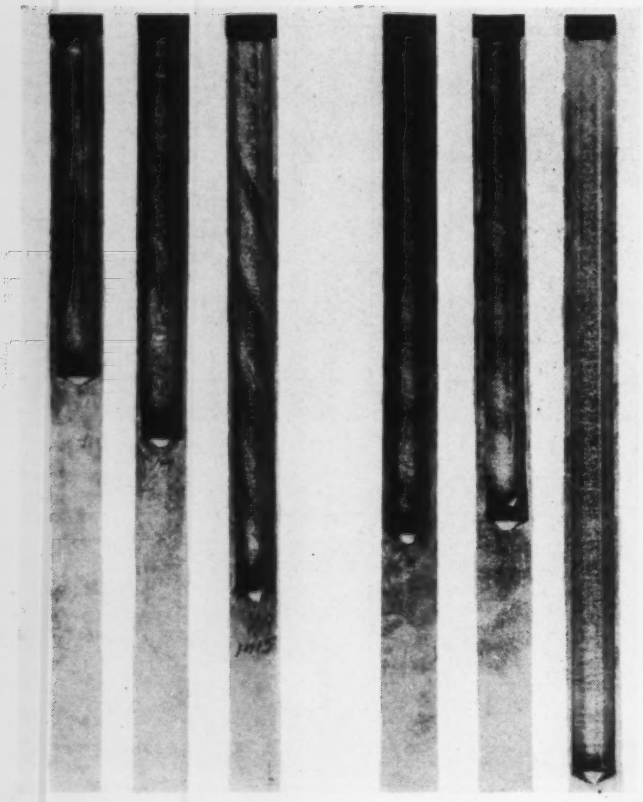


FIG. 10 SECTIONAL VIEW OF 1/2-IN-DIAM DRILLED HOLES SHOWING EFFECT OF VARYING CHISEL-EDGE ANGLES ON QUALITY OF HOLES DRILLED AT 1415 RPM AND 0.014-IN. FEED

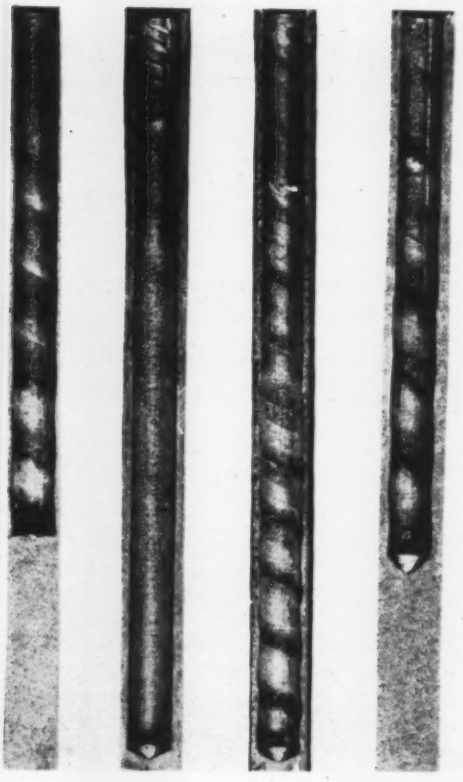


FIG. 11 SECTIONAL VIEW OF 1/2-IN-DIAM DRILLED HOLES SHOWING EFFECT OF ALTERING DRILL POINT ON QUALITY OF HOLE

Chipping of the cutting edges of the high-helix-angle drills may occur due to the weakening of the edges by the high rake angle incidental to the high helix angles and due to the drill wobbling or not centering itself as it starts to cut. This chipping may be prevented by grinding flats on the cutting edges which effectively reduces the helix angle at the end of the drill and provides a stronger cutting edge, and by using the spur point to center the drill. The recommended ground flats on the edges are shown in Fig. 15.

A summary of the information on drill pointing shows the following types of points should be recommended:

Shallow Holes. Smaller point angles in the range of 90 deg, or rounding the corners of a drill, will produce a good surface finish and an accurate hole. A drill with an accurately ground spur or center point will improve the accuracy and surface finish of the drilled hole.

Deep Holes. A standard point angle of approximately 118 deg will be best, but the chisel-edge angle should be large (135 to 150 deg) for high-helix-angle drills and smaller (120 deg) for low-helix-angle drills. A large spur or center point on the end of a 118-deg-point-angle drill helps to prevent spirals as the drill starts the hole. The web at the point should not be thinned as this will cause out-of-round, oversized, and spiraled holes.

Effect of Speed and Feed. Magnesium alloys may be drilled with much heavier feeds than other metals. Tests have shown that, besides the added speed in drilling, in many cases the heavier feeds result in straighter holes with better surface finish. Fig. 16 shows some holes drilled, in experimental tests, in which 1/2-in-diam drills penetrated to a depth of 9 in. The drill used in these tests had a 40-deg helix angle, standard 118-deg point angle, 135-deg chisel-edge angle, and was operated at 900 and 1415 rpm with feeds ranging from 0.004 to 0.031 in. per revolution.

At the low cutting speed, 120 fpm, the holes were not as smooth as those drilled at 180 fpm and had some spiraling at the start of the holes which decreased as the feed was increased. Drilling 1/2-in. holes at 180 fpm gave smooth straight holes at all feeds. The surface finish at 0.009-in. and 0.014-in. feed was better than lighter feeds because of better chip disposal and better than the heavier feeds because of the absence of coarse feed marks.

In conjunction with these results, the curves in Figs. 8 and 9 show the effect of varying rates of feed on the torque. The torque developed does not increase very rapidly until feeds of approximately 0.014 in. are exceeded. Therefore, for best all-around performance, a minimum speed of 180 fpm and a feed of 0.014 in. per revolution are indicated. The torque curves show further that feeds up to 0.021 in. can be readily used for production drilling of deep holes, providing the proper drill is used.

The feeds and speeds shown in this paper as the optimum values do not represent the maximums possible, inasmuch as they were limited by the machines used. Indications from the literature and these tests point to the desirability of higher speeds, and cases have been observed where a feed of 0.05 in. per revolution has been used on fairly deep holes, although the maximum value should probably be around 0.035 in. per revolution.

Effect of Polishing and Opening Drill Flutes. The drills, originally supplied with unpolished flutes, were tested with sand-blasted finish and then polished by the drill manufacturer to give a smooth lustrous surface typical of most commercial drills. After the polished-flute drills were tested they were returned to the manufacturer and the flutes were "opened out" by cutting away part of the land, leaving a larger chip space, as illustrated in Fig. 14. The web thickness was also decreased slightly. The polishing of the flutes of the drill had a beneficial effect in that the chips flowed up the flutes of the drill more easily. The small-helix-angle drills reacted more favorably to flute polishing than the high-helix drills.

Opening up the flutes of the drills allows more chip space and at the same time decreases the structural strength of the drill. The decrease in structural strength caused no drilling difficulties even when using feeds of 0.031 in. Since low-helix-angle drills should be used mainly for shallow holes, where chip packing does not occur it is generally not necessary to have these drills made with the flutes opened up. With standard 30-deg-helix-angle drills, opening of the flutes produces good results. In drilling deep holes, where high helix angles of approximately 40 to 45 deg are necessary, the opening up of the flutes improves chip disposal by allowing room for the accumulation of the rapidly formed metal chips and prevents jamming in the flutes.

(*A*) (*B*)

FIG. 13 DRILLS RECOMMENDED FOR USE ON MAGNESIUM ALLOYS
(*A*, shallow-hole drill; *B*, deep-hole drill.)

FACTORS AFFECTING $^{5}/_{32}$ AND $^{1}/_{2}$-IN-DIAM DRILLS

Effect of Chip Formation. The drilling equipment limited the range of speeds from 143 rpm (18 rpm) to 1415 rpm (184 fpm) for $^{1}/_{2}$-in-diam drills but, within this range of speed, there was practically no effect on chip formation. When feeds up to 0.006 in. were used the chips were continuous spiral coils regardless of cutting speed, whereas feeds above 0.009 in. formed chips which were always broken regardless of the cutting speed. When drilling deep holes with $^{1}/_{2}$-in-diam drills, the most desirable chip formation was decidedly different than when using

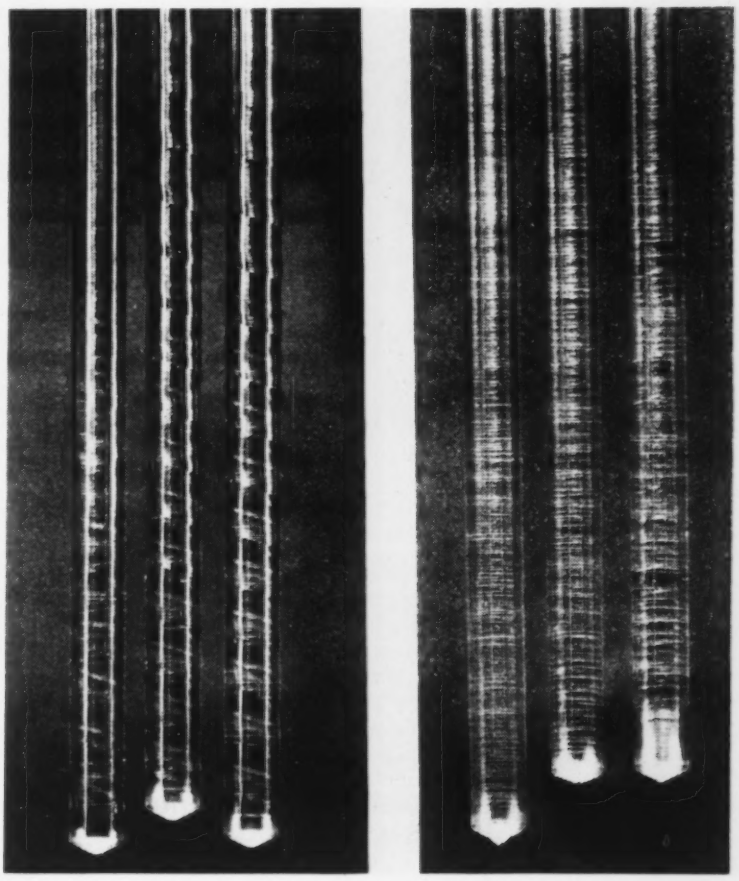


FIG. 12 HOLES OF $^{1}/_{2}$-IN-DIAM DRILLED WITH *A* STANDARD POINT; *B* 118-DEG ANGLE PLUS SPUR POINT

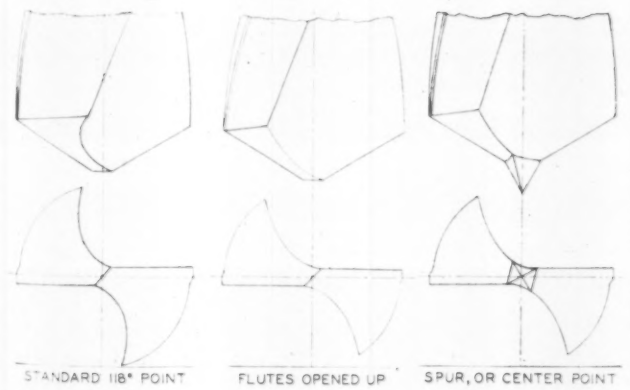


FIG. 14 DIAGRAMS ILLUSTRATING FEATURES OF DRILLS RECOMMENDED FOR USE ON MAGNESIUM ALLOYS

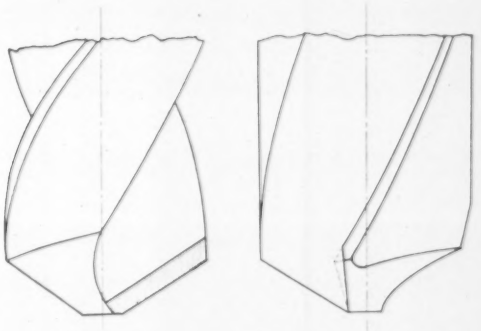
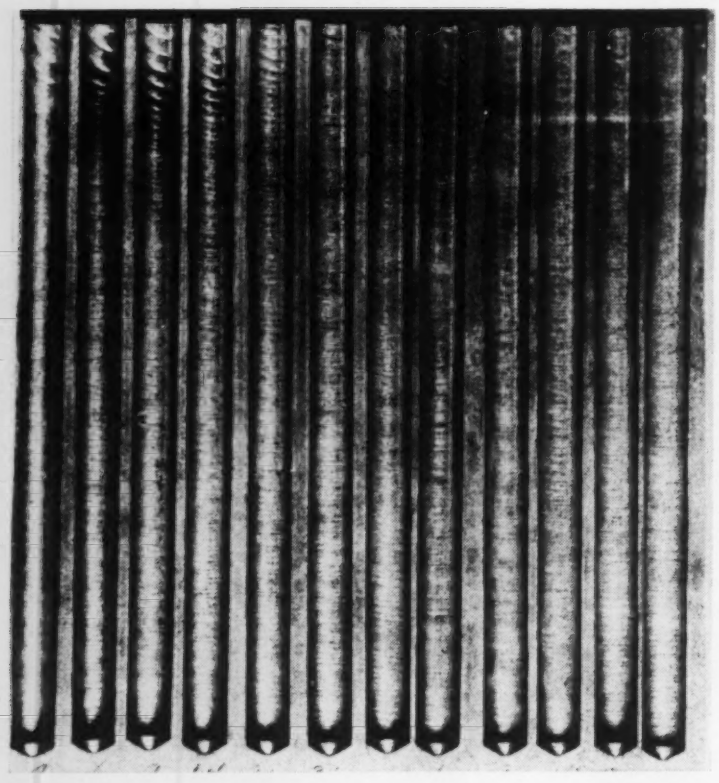


FIG. 15 DIAGRAM ILLUSTRATING TYPE OF FLAT GROUND TO PROLONG DRILL LIFE



0.004 0.006 0.009 0.014 0.021 0.031 0.004 0.006 0.009 0.014 0.021 0.031
Feed in inches
900 rpm 1415 rpm

FIG. 16 SECTIONAL VIEW OF 1/2-IN-DIAM HOLES, SHOWING EFFECT OF CUTTING SPEED AND FEED PER REVOLUTION ON FINISH OF DRILLED HOLES

the smaller 5/32-in. drills. Small drills, when drilling deep holes, should have the chip feed itself up the flutes of the drill in the form of a long straight ribbon. Large drills cannot operate successfully when using this type of chip because in the larger flutes the chips form continuous spirals which break up and pack in the flutes, causing the drill to bind and cut oversize. Therefore, the feed of large drills should be increased until the chips are completely broken and will easily pass out of the drill flutes.

Effect of Cutting Fluids. Since cutting fluids are often used when machining magnesium alloys, a series of tests was made to determine their effectiveness in drilling. The cutting fluids used were a light-mineral-oil-base material, having a viscosity of approximately 50 sec Saybolt, and commercial kerosene. These were applied at the rate of 2 gpm at the top of the drilled hole.

Drills with low and high helix angles were tested when the flutes had been opened and polished. The cutting oils proved beneficial by reducing the packing of chips when used on the low-helix-angle drills and permitted much deeper holes to be drilled. As the helix angle increased, the effectiveness of the cutting fluid decreased so that, for high-helix drills, it made little difference if cutting fluids were used. If it had been possible to use "oil-hole" drills where the cutting fluid could be pumped through the drill, forcing the chips out through the flutes, then the oil undoubtedly would have helped with the chip disposal. In these tests, however, the oils were applied at the top of the hole and since the chips completely filled the flutes, the oils could show only slight benefit. Even though the fluids had little effect on chip disposal, they did reduce the temperature of the work and performed quite effectively as a coolant. No difference could be noted in the effectiveness of the two types of cutting fluids used.

TABLE 1[a] COMPARATIVE DRILLING CHARACTERISTICS OF VARIOUS METALS

(Data for 1/2-in-diam drills)

Metal	Speeds, sfm	Feeds, ipr	Torque $f = 0.009$ in., lb-ft	Thrust $f = 0.009$ in., lb	Power consumption: $f = 0.015$, in., hp/cu in./min
Carbon tool steel	60	0.004–0.010	14.0	1150	1.47
S.A.E. 1112	100	0.004–0.010	7.3	620	0.78
Cast iron	100	0.004–0.010	4.2	400	0.44
Brass	200	0.010	2.9	190	0.31
Aluminum alloys	250	0.006–0.020	3.0	350	0.32
Magnesium alloys	300–2000	0.014–0.030	1.9	85	0.20

[a] Data from references (7, 8, and 9).

DRILLING OF MAGNESIUM AS COMPARED TO OTHER METALS

These data show that, with the correct type of drill, extremely deep holes can be drilled in magnesium alloys with speed and precision The necessity of using drills with certain special features imposes no undue penalty on the use of magnesium, inasmuch as practically all metals require special types of drills to secure holes of maximum quality. The comparison of cutting speeds, feeds, and power required for machining other metals, given in Table 1, clearly indicates the good drilling characteristics of magnesium.

In Table 1, the torque values show that deeper holes can be drilled in magnesium than in any other material without creation of excessive torques. The cutting-speed and feed values show that holes may be drilled from approximately 2 to 30 times as fast as in any other engineering metal. It must be remembered, however, that the available power in the drilling machine limits the speed of cutting but because of the low horsepower required to remove 1 cu in. of magnesium extremely fast drilling can be done even on comparatively low-powered equipment.

Table 2 gives a summary of drilling recommendations for drilling deep and shallow holes in magnesium alloys at maximum speed and for best-quality holes.

CONCLUSIONS

1 There is a difference in the drilling action between drills of small (5/32 in.) and large (1/2 in.) diameter which requires different techniques of operation for each size range.

2 Helix angles:

(*a*) For shallow holes, the helix angle should be in the range of 10 to 20 deg for both 5/32-in. and 1/2-in. drills, although higher helix angles can be used with a sacrifice in quality of the drilled hole.

(*b*) Deep holes, ordinarily considered as those having a depth of over 5 times the drill diameter, require the use of 40 to 45-deg-helix-angle drills for high-speed quality production. This range of helix angle is required in both the 5/32 and 1/2-in. drills.

TABLE 2 DRILLING RECOMMENDATIONS

	Helix angle, deg	Point angle, deg	Chisel-edge angle, deg	Special point	Speed, fpm	Feed, in. per rev	Flutes	Remarks
Deep holes (depth more than 5 diameters)	40–45	118	135 to 150	Spur point to remove spirals	300 to 2000	0.004 to 0.021	Polished and opened	For large drills (1/2 in.) use heavy feeds (0.014 to 0.021 in.). For small drills use light feeds (0.006 in. max)
Shallow holes (depth less than 5 diameters)	10–20	70 to 118	120 to 135	None	300 to 2000	0.004 to 0.030	Polished and opened	Standard drills may be used; 70-deg point angle reduces thrust and improves accuracy

3 Drill pointing:

(*a*) The chisel-edge angle for 1/2-in. drills should be in the range of 135 to 150 deg to insure straight, accurate holes. Different angles result in spiraled and oversized holes. Heavy feeds require chisel-edge angles of approximately 150 deg to insure sufficient relief. For shallow holes, the chisel-edge angle may be 135 deg or smaller, but for good-quality deep holes, it must be as recommended and accurately centered.

(*b*) The point angle may vary from 70 to 118 deg in drilling shallow holes, but for deep-hole drilling, it should be restricted to the standard 118-deg angle. Smaller or larger angles result in out-of-round and inaccurate deep holes.

(*c*) Special drill points can be used to advantage in both shallow- and deep-hole drilling. For shallow holes, rounding the corners of the point will give holes nearer to size, and with better surface finish. Adding a spur point will pilot the drill, preventing a spiraled out-of-round hole. In deep-hole drilling, a spur point added to the 118-deg point angle will greatly improve the accuracy and surface finish.

4 Opening and polishing flutes:

In the drilling of shallow holes the opening and polishing of the drill flutes had little effect on the operation of the drills. This was true for both the 5/32 and 1/2-in-diam drills. For deep-hole drilling with 5/32 and 1/2-in. drills, the increase in the flute space and improvement in the surface of the flutes aids in the removal of chips. This prevents high torques and rough surface finish due to jamming of the chips in the flutes. The effectiveness of polished flutes is more noticeable with the high-helix-angle drills when drilling deep holes.

5 Feeds:

Feeds in the range of 0.004 to 0.040 in. per revolution can be used in drilling shallow holes with both 5/32 and 1/2-in-diam drills.

Deep-hole drilling requires the use of feeds of approximately 0.006 in. for 5/32-in. drills and feeds from 0.009 to 0.021 in. for 1/2-in-diam drills. Heavy feeds reduce spiraling, but a feed of 0.014 in. was found to be optimum, considering all aspects for 1/2-in. drills.

6 Chip formation:

The feeds recommended in the preceding section produce the correct chip formation for ease in drilling deep holes in magnesium alloys. Smaller drills, 5/32 in. diam, require a straight ribbonlike chip which can follow the flutes, whereas larger drills such as 1/2 in. diam require a broken, segmented chip which will fill and follow up the flutes without jamming. Any chip formation will function satisfactorily in drilling shallow holes.

7 Cutting speeds:

For both the 5/32 and 1/2-in. drills, there was an improvement in surface finish of drilled holes with the use of higher speeds. Speeds of 80 and 180 fpm proved to be best for 5/32 and 1/2-in. drills, respectively, but these were limited by the equipment. The literature and commercial practice recommend from 300 to 2000 fpm.

8 Cutting fluids:

Cutting fluids of the types recommended for use on magnesium alloys help prevent packing of the chips and keep the work cool. Lighter-viscosity fluids work best in this operation.

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Tin-Base Bearing Metals

THE Tin Research Institute's publication No. 111 records a comprehensive study of the factors governing the adhesion of tin-base bearing alloys to various backing metals, including steel, bronze, copper, brass and cast iron. The results of this investigation were first reported in the *Journal of the Institute of Metals*, Vol. 68, 1942, in a paper by W. T. Pell-Walpole, J. C. Prytherch, and B. Chalmers.

The conditions for obtaining efficient bonds are considered, and the many factors affecting these conditions in manufacturing operations are examined. A large number of tests are described which indicate the most suitable methods of preparing and tinning the bearing shell, and of casting and cooling the lining. The results of thousands of individual tests show the effects of variations in alloy composition, mould design, temperature of metal and mould, and rate and direction of cooling, in relation to both hand pouring and die-casting and also to centrifugal methods of production. The part played by shrinkage cavities at or near the bond is also examined, and methods are suggested by which this trouble may be avoided.

Physical Properties of LAMINATED PLASTICS

By R. W. BARBER

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LAMINATED phenolic plastics are by no means new; they have been manufactured for a period well over 20 years. They first became familiar to the public in radio panels—in the form commonly known as Bakelite. In this as in practically all early uses, the material was primarily considered because of its electrical properties. The use of these materials in electrical applications developed rapidly and a high degree of specialization came about in the field of electrical insulation.

Laminated phenolic plastics have been classified into groups of standard grades which are manufactured by practically all of the "laminators" in the industry. The efforts of the National Electrical Manufacturers Association and the American Society for Testing Materials deserve recognition with respect to this classification; the former for the publication of Laminated Phenolic Standards, which lists a large group of standard grades with the properties to be maintained in their manufacture, the latter for the establishment of standard mechanical and electrical test methods to be used as controls in both manufacture and purchase of the plastic materials.

Among these established and standardized grades are several which may be truly classified as mechanical rather than electrical materials. Few instances exist, however, where full advantage of the physical properties of the plastic have been utilized. An outstanding exception has been in the manufacture of silent gears.

Significant recent developments in purely mechanical or structural plastics are the impregnated and compressed wood materials (known to the trade as "Compreg"), glass-cloth laminates, and laminated high-strength paper material. Recognition is due Stamm and his co-workers of the Forest Products Laboratory for their work in the development of Compreg. This material develops unusually high strength and stiffness in the direction of the wood fiber. The recent manufacture of "Fiberglas" cloth on an industrial scale has made available to the laminating industry a very high-strength base material. Some properties are attained in its use which exceed anything previously tried. The very recent high-strength paper, also from the Forest Products Laboratory, is still somewhat undeveloped but has been shown to have properties far in excess of conventional paper-base grades. Details on this material are confidential at the present. Great improvements in standard grades in fabric- and paper-base laminates have been made possible through research in resin manufacture and control.

MOLDED STRUCTURAL FORMS

Among the important engineering developments in laminated plastics is the use of these materials in molded structural forms. In this connection, it is well to point out the difference between molding-powder plastics and laminated phenolics. The former is a low-strength material having great moldability but rather poor mechanical properties. The latter, which has very high strength, is restricted in flow because of the continuous network of base material. Molding technique has undergone changes and improvements to the extent that there are virtually no shapes that cannot be molded. Deep-drawn forms may be handled by the expedient of preforming; negative drafts have yielded to the low-pressure, rubber-bag molding technique. Curved or irregular cores for hollow moldings may be made of low-melting alloys, which are then melted for removal from the finished piece. The most economically satisfactory molding, however, is done at high pressure in steel or Mechanite two-piece molds having no undercuts and comparatively large draft. Molded pieces from this type of mold are replacing aluminum castings, zinc die castings, aluminum and steel drawn forms, and spot-welded sheet-metal fabrications.

The initial cost, construction time, and engineering development entailed in making a production mold in anything but the simplest shapes require production lots of 15,000 to 20,000 pieces minimum. This limitation will be alleviated when a satisfactory method for the production of molds at low cost has been developed. Progress in this direction has been achieved in the development of new casting alloys which are both strong and easily machined. Some success has been reported in the use of electro-deposition and metal spraying.

STRENGTH OF LAMINATED PLASTICS

A laminated material consisting of a bonding agent (phenolic resin) and base material combines in the most practicable way the properties of both component parts in much the same way that steel and concrete in reinforced-concrete structures support each other. The phenolic resin, which has a low tensile strength, furnishes compressive strength and stiffness, occupies free space between the fibers of the base, and bonds the fibers and layers together. The fibers of the base material contribute a major part of the composite tensile strength.

The usual base of laminated plastics is cellulose, which may be derived from one of several sources in varying degrees of refinement. A typical laminate may be made up of a cotton fabric impregnated with a phenol-formaldehyde resin. The ultimate strength of cotton fabric is from 45,000 to 50,000 psi in tension. The pure resin fails at 5000 to 8000 psi in tension. On the other hand, the resin has an ultimate compressive strength at about 38,000 psi. No figure is available for the strength of the cotton fiber in compression because of the experimental difficulties. The strength of the laminate will be somewhat as follows: 12,000 psi in tension and 40,000 psi in compression.

The principal attainable variations in physical properties of laminated materials depend largely on the base material. A range in tensile strength may be had between 12,000 psi for a cotton-fabric base to a maximum of 40,000 to 45,000 psi for wood veneer, glass fiber, and special paper-base material. The compressive strength remains fairly constant and is not greatly affected by variations in base materials. However, a wide range in impact strength is attainable through the use of various base materials. This property can be varied through the extreme range of 1.5 to 25 ft-lb per in. of notch in the Izod impact test. The impact strength does not seem to follow any definite

Contributed by the Rubber and Plastics group of the Process Industries Division for presentation at the Annual Meeting, Nov. 30–Dec. 4, 1942, of THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS.

CHART OF PHYSICAL PROPERTIES OF LAMINATED PLASTICS

	Paper base — Panelyte grade 270			Wood Base — Panelyte grade 600			Fabric base — Panelyte grade 900			Glass-cloth base — Panelyte pc. 5576			High-strength paper base — Panelyte pc. 7797		
	Proportional limit	Elastic modulus	Ultimate strength	Proportional limit	Elastic modulus	Ultimate strength	Proportional limit	Elastic modulus	Ultimate strength	Proportional limit	Elastic modulus	Ultimate strength	Proportional limit	Elastic modulus	Ultimate strength
		($E \times 10^{-6}$)			($E \times 10^{-6}$)			($E \times 10^{-6}$)			($E \times 10^{-6}$)			($E \times 10^{-6}$)	
Flexure, psi															
Flat, with grain	14,800	1.52	26,900	27,500	3.70	35,500	13,700	0.700	19,400	31,000	3.40	41,500	..	2.30	35,000
across grain	12,400	1.42	25,400	..	0.642	3,380	10,900	0.555	19,100	29,000	..	38,800	..	..	28,000
Edge, with grain	13,200	1.23	24,700	..	3.50	23,700	12,800	0.600	18,300	..	..	..	..	..	..
across grain	11,050	1.16	22,600	..	0.650	3,670	9,100	0.510	18,100	..	..	..	..	..	..
Tension, psi															
Flat, with grain	7,500	2.90	16,200	35,000	4.00	36,200	7,140	1.08	12,200	..	3.10	37,500	..	3.45	45,500
across grain	6,100	1.54	14,000	..	..	..	5,180	0.810	10,100	..	..	..	..	..	..
Compression, psi															
Flat	..	1.90	45,000	..	2.63	20,100	..	0.520	40,000	..	3.50	55,000	..	..	..
Edge	..	1.20	23,000	..	0.775	24,300	..	0.590	19,700	..	..	..	..	..	..
End	..	1.40	24,000	..	3.30	44,100	..	0.420	20,400	..	..	..	..	..	..
Shear, psi															
Flat, with grain	..	..	14,700	..	..	4,200	..	..	12,000	..	..	12,000	..	..	14,400
across grain	..	..	15,000	..	..	14,100	..	..	12,200	..	..	17,500	..	..	13,100
Edge, with grain	..	..	3,000	..	..	4,000	..	..	6,000	..	..	..	..	..	..
across grain	..	..	17,100	..	..	13,300	..	..	18,300	..	..	..	..	..	..
End, with grain	..	..	2,810	..	..	2,280	..	..	5,800	..	..	..	..	..	..
across grain	..	..	16,200	..	..	5,540	..	..	5,500	..	..	..	..	..	..
Impact (Izod), ft-lb per in. notch															
Flat, with grain	2.20			21.0			4.50			25.2			6.60		
across grain	1.70			0.27			4.00			21.5			4.80		
Edge, with grain	0.90			15.6			2.60			18.6			0.91		
across grain	0.75			0.25			2.20			17.2			0.81		
Bearing,[a] lb															
Flat, with grain	1,000			..			1,100			..			643		
across grain	1,500			..			1,650			..			..		
Bonding, lb, 1/2 in. thick	850			..			2,450			..			..		
Fatigue, psi (100,000 cycles)															
Unnotched, flat, with grain	5,000			8,000			5,000			..			..		
across grain	4,890			..			4,000			..			..		
Notched, flat, with grain	2,900			7,500			3,500			..			..		
across grain	3,600			..			4,900			..			..		
Water absorption, per cent, 24 hr, 1/8 in. thick	1.50			4.50			1.20			0.98			1.80		
Density, g per cu cm	1.35			1.35			1.35			1.99			1.40		
Rockwell hardness, M scale	111			95			101			108			105		

[a] Proposed Federal Specification.

rule in comparison with the other strength characteristics of these materials. Impact strength of paper grades is lowest and ranges upward through light and heavy fabric, Compreg, and glass cloth, which has the highest impact strength yet obtained.

MECHANISM OF FAILURE

Laminated plastics are nonhomogeneous materials. This is true both in a micro and a macro sense. The strength varies greatly according to the direction in which the test specimen is taken or in which the stress is applied. A fairly accurate analogy may be had in comparing the laminated plastic to a single anisotropic crystal in which the layers of base material are roughly similar to the parallel cleavage planes in the crystal. The stress applied to such a crystal produces either slippage along the cleavage planes or parting, depending on whether the crystalline material is ductile or brittle. Usually, a combination of both phenomena occurs with one or the other in predominance. Laminated plastics have comparatively little ductility and the ultimate failure occurs without a yield point. In most cases, a well-characterized proportional limit appears in a stress-strain diagram. The position of the proportional limit, as in all materials, depends on the rate of loading in the testing machine. However, normal temperatures are in the critical range for creep of plastic materials and therefore the rate of loading is more critical in these materials.

It would be dangerous to carry this analogy any further, as the structure of synthetic plastics is essentially noncrystalline and, in fact, amorphous in the ordinary sense of the word. This amorphous nature is highly advantageous in the resistance of these materials to fatigue failure. While the mechanism of failure under high-frequency reversed tension and compression cycles is not completely understood, it is commonly believed to be related to crystalline structure where failure occurs along the cleavage planes and boundaries of the heterogeneously orientated microcrystals. On the other hand, the creep might possibly be greater in plastics because of the lack of a regular molecular or atomic pattern such as exists in a crystalline material.

The use of laminated plastics in truly structural applications has, in the past, given rise to occasional failure under constant stress due to creeping of the material. This property is in the process of thorough study and may be kept under control through proper engineering design. The proposed Federal Test Specifications include a method for the measurement of creep under a constant tension. From measurements of this kind, the proper design factor to produce negligible creep under constant load can easily be obtained. In this connection it should be pointed out here that Compreg has the least cold flow of any material thus far tested. This is undoubtedly largely due to the parallel orientation of the cellulose fibers in the base material. As for all structural materials the proportional limit and elastic modulus are the most important design figures.

RESISTANCE TO CHEMICALS, CORROSION, AND FATIGUE

The most valuable properties of laminated plastics in addition to their high strength are low density, resistance to chemical action and corrosion, and resistance to fatigue failure. The low density, intermediate between wood and aluminum among structural materials, results in excellent resistance to buckling of plates and beams and surpasses that of equal weights of metallic material.

Excellent use of the properties of Panelyte plastic has been made in the design of web-reinforced aircraft flooring material now in full production. This structure is molded from fabric-base material which was selected for the application because of its excellent moldability and toughness. The bulk modulus, which is twice that of the aluminum alloy which is replaced, results in a large advantage in resistance to buckling of the surface. Inasmuch as the elastic modulus in tension is somewhat low in this grade, the elastic modulus – moment of inertia product, EI, developed as a simple beam, is increased with the use of a thin strip of a more highly inelastic aluminum alloy in the outermost point in the section. The metal strip is perforated to decrease shear slippage.

SOME EXAMPLES OF USES OF LAMINATED PLASTICS

The resistance of phenolic materials to the combined action of chemicals, solvents, and moisture is being utilized in another interesting development—the molding of large interchangeable fan blades for water-cooling towers. These blades are among the largest moldings that have ever been manufactured, weighing 25 lb and having a maximum section of about $3\frac{1}{2}$ in. Canvas-base material was selected for its superior moldability and high bonding strength. The blades are proving superior to those of cast aluminum which they replace, because of better resistance to corrosion, lighter weight, and smoother operation owing to vibrational damping characteristics of the plastic.

Air deflectors for air-cooled aircraft engines are being molded, on what will soon be a large scale, of fabric-base material. Aluminum alloys previously used failed frequently in fatigue, a weakness inherent in this material and accentuated in part by forming strains due to cold working. In contrast, plastic baffles, which were actually cracked in installation, have performed satisfactorily for many hundreds of hours without indication of growth of the crack. The full life expectancy of plastic baffles is not yet known; but they outlast aluminum deflectors by two and three times. They have not yet been known to fail in fatigue.

Production is mounting in a specially molded tube of paper-base material for push-rod housings for air-cooled engines. Resistance to fatigue failure and low thermal conductivity, both superior to the aluminum alloy replaced, were required. Aircraft operating at high altitudes and low temperatures encountered lubrication difficulties, because of the loss of heat through the metal tubes formerly used, which caused the lubricant passing through the push-rod housing to congeal. Plastics completely solved the problems. The plastic material is also impervious to the action of lubricants.

Plate stiffness and specially developed dimensional stability in a fabric-base grade is now being applied to skin material for the manufacture of trainer aircraft. This material releases large quantities of strategic metal for warplanes without sacrifice in quality or performance.

Large-scale usage, development, and substitution breed additional shortages. This is largely true in regard to resin making. Phenol and cresylic acid production is somewhat behind increased demand. Recent developments have resulted in the utilization for structural plastics of some of the low-grade cresylic acids heretofore considered worthless for use as a resin-making ingredient. This development has increased appreciably the total output available.

With the realization by design engineers that the potential uses and advantages of laminated plastics, brought to the foreground by the shortage of other structural materials because of the war, have not yet begun to be exploited, new important uses are being found almost daily and consumption of these materials is assuming large proportions. These uses are not to be regarded as emergency "ersatz" applications as, in most cases, it was necessary to prove superior performance before substitition was made. With the return of peacetime production, there is every reason to believe that laminates will not only continue in their present new uses and return to their prewar applications but also will find employment in quantities and services previously undreamed of.

CAUSTIC EMBRITTLEMENT RESEARCH BRINGS RESULTS

Work Conducted at the United States Bureau of Mines to Be Completed in 1942

By J. H. WALKER[1]

WITH a creditable record of accomplishment, the extensive research program dealing with the causes and prevention of caustic embrittlement in boilers will terminate during the present year. This project, it will be recalled, has been conducted at the U. S. Bureau of Mines under the auspices of Subcommittee No. 6 of the Joint Research Committee on Boiler Feedwater Studies[2] and has been supported by contributions from industry. The work was started several years ago because the owners and users of steam boilers found themselves in need of more effective means of preventing caustic embrittlement.

This article briefly summarizes the results that have been obtained. The detailed findings have appeared in technical papers, magazine articles, and bulletins of which a Bibliography is appended.

The investigation has been conducted principally along two lines; one the laboratory work at the Bureau of Mines, and the other the practical application, in the field, of the findings at the laboratory. In this latter phase, the railroads and the industrial and electric-utility operators of boilers have contributed most generously in trying out those ideas which have come out of the laboratory work.

At the beginning the work at the Bureau of Mines was under the supervision of Dr. E. P. Partridge, then Director of the Non-Metallic Minerals Experiment Station, assisted by Dr. W. C. Schroeder. Since 1936 the work at the Bureau has been under the supervision of Dr. Schroeder, assisted at various periods by Messrs. A. A. Berk, R. A. O'Brien, and C. Kerby Stoddard.

SOLUBILITY OF SODIUM SULPHATE

The original objective was the determination of the solubility of sodium sulphate in the presence of various other salts. It was thought at that time (1932) that sodium sulphate, the recommended inhibitor of embrittlement in the "A.S.M.E. Suggested Rules for the Care of Power Boilers," could be more intelligently used if we knew more about its solubility characteristics.

Solubility data were determined at temperatures between 150 C and 350 C for sodium sulphate in the presence of sodium hydroxide, sodium carbonate, sodium chloride, and sodium phosphate. The results were duly reported and are readily available in the technical literature.

Upon the completion of the solubility work, so much interest was evident in the whole problem of embrittlement that it was decided to undertake a fundamental study of the subject. The results of that study—many of them valuable and some of them startling—have entirely overshadowed the sodium-sulphate-solubility work and have, unexpectedly, cast much doubt upon the effectiveness of sodium sulphate as an inhibitor of embrittlement.

The work at the Bureau has not yielded a simple and complete answer to the embrittlement question; indeed the problem does not appear to be amenable to any simple solution. However, the laboratory and the field work of this investigation as well as the concurrent work at other laboratories, notably the University of Illinois, have greatly clarified the problem and have revealed some effective chemical inhibitors.

The problem of embrittlement might be approached from the metallurgical viewpoint, with the hope of finding or developing an embrittlement-proof steel of new composition or made by a new type of steel-melting practice. But because the committee was chiefly concerned about existing boilers, in which the water chemistry can be changed but the steel composition cannot, the more suitable approach seemed to be through the control of the chemical constituents of the water. The work at the Bureau has therefore been principally a study of the relationship of the substances in boiler water to the embrittlement of steel and a search for chemicals which, added to the water, will inhibit embrittlement.

THE THREE CONDITIONS NECESSARY FOR EMBRITTLEMENT

There have been many differences of opinion on various points among individuals interested in the research project, and there have been contradictory results reported by different laboratories; but there seems to be complete agreement on the idea that caustic embrittlement can occur only when the following three conditions simultaneously exist.[3]

(*a*) Certain chemical conditions of the boiler water.
(*b*) Physical conditions which permit high concentration of the dissolved solids.
(*c*) Contact of the concentrated solution with highly stressed boiler metal.

The necessary chemical conditions are the presence of sodium hydroxide in appreciable amounts, the absence of inhibiting agents and, at the higher pressures, the presence of silica.

The physical conditions which permit concentration of the dissolved solids are either leakage to the atmosphere or perhaps the existence of small spaces in the boiler seams communicating with the water space of the boiler. (The latter of these two conditions has not, however, appeared to the Bureau investiga-

[1] Chairman, Subcommittee No. 6 of the Joint Research Committee on Boiler Feedwater Studies.

[2] The Joint Research Committee on Boiler Feedwater Studies, of which C. H. Fellows is chairman, is sponsored by the following groups: Association of American Railroads; American Boiler Manufacturers Association; The American Society of Mechanical Engineers; American Society for Testing Materials; American Water Works Association; Edison Electric Institute.

[3] From the paper, Bibliography (13).

tors to be a tenable explanation of concentration except under special conditions.)

Contact of the concentrated solution with highly stressed metal is a requirement which has been thoroughly demonstrated. Cracking has not been observed unless the stress is near or above the yield point, but it may be a local or intergranular stress; it need not be an externally applied stress. Previous cold-working of the steel renders it more susceptible.

The foregoing is not intended to be a complete discussion of the causes of embrittlement; but those three necessary conditions should not be overlooked in any discussion of the subject. Cracking cannot take place without their simultaneous occurrence. Thus, "poor workmanship" is not the sole cause of embrittlement, as has so often been charged. It accounts for but one (or sometimes two) of the three necessary factors; it may cause high stresses and, by permitting leakage, it may cause concentration of the caustic at the points of leakage.

The modern stationary boiler with welded seams should be almost wholly immune from embrittlement, because there are no riveted seams in which caustic concentration may take place. The rolled-in tube ends, however, remain as a vulnerable region. Railroad locomotives because of their riveted seams and because of difficult feedwater conditions are particularly susceptible.

The exact mechanism which causes the attack to be along the grain boundaries has not been investigated and therefore is not entirely understood; however, by the workers at the Bureau, it is believed to be selective attack by the sodium hydroxide upon the intergranular material. (Some other investigators have favored a theory that atomic hydrogen, resulting from the reaction of iron with water, can under some circumstances cause intercrystalline cracking at temperatures in the boiler-water range.)

WHAT THE RESEARCH HAS ACCOMPLISHED

The research work has produced certain specific and practical results. One of these is the embrittlement detector, a device by means of which can be determined whether or not a boiler water is of an embrittling character. This instrument makes use of a steel specimen which is subjected to a heavy bending stress. The water which is being tested is caused to flow through the apparatus, and a continuous but minute leakage to the atmosphere causes the water to reach, by evaporation, a high degree of concentration. The concentrated solution is in contact with the stressed area of the specimen. The conditions simulate those existing in a boiler seam at a point of leakage. With waters which are of an embrittling nature, typical intercrystalline cracks occur in the specimen, usually within thirty days. The detector can be used in the laboratory, or it can be attached to an operating boiler and, when adjusted and controlled carefully, will indicate the embrittling characteristics of the boiler water.

With the co-operation of boiler operators, more than one thousand steel specimens have been tested in detectors installed on scores of boilers, including many railroad locomotives. The detector has also been a most useful laboratory tool for the investigation of embrittlement inhibitors. When used in the laboratory, it is attached to an externally heated cylinder containing the water which is being studied.

The device has been patented and the patent assigned to the Government of the United States of America (as represented by the Secretary of the Interior and his successors). Anyone may use it, but consultation with those who have worked on this research project at the Bureau or Mines prior to its use is recommended.

Perhaps the most surprising result of the entire investigation has been that the effectiveness of sodium sulphate as an inhibitor has not been satisfactorily confirmed. In the earlier years of the investigation, it appeared to be somewhat protective in certain laboratory tests but it has not prevented the cracking of detector specimens either in the laboratory or when the detector is attached to a boiler. It is of course conceivable that sodium sulphate may protect a boiler even though it does not protect a steel specimen in the detector; but the cracking of dozens of specimens that have been exposed to waters of high sulphate content certainly demonstrates that sulphate does not render a water inherently incapable of causing embrittlement.

The process of finding suitable embrittlement inhibitors has been largely a trial-and-error process, and the trail has led the investigators up many a blind alley. However, a few substances have been found which are effective in their appropriate pressure ranges.

INHIBITORS

Lignin-containing materials, such as waste sulphite liquor, and tannin materials, particularly quebracho, have been found to be inhibitors of embrittlement. Waste sulphite liquor is a by-product of the wood-cellulose industry. This material is not as effective an inhibitor as quebracho extract, a phlobatannin obtained from the heartwood of the quebracho tree of South America and imported in large quantities for the tanning and dyeing industries.[4] Quebracho is stable and has been effective (as tested by the detector) in boilers operating at pressures up to 700 psi. A ratio of quebracho to total alkalinity in the boiler water of not less than 0.4 to 1 is required for satisfactory results.

Sodium nitrate has been found to be stable up to 400 psi. It has proved to be an effective inhibitor, when tested by the detector, if the ratio of sodium nitrate to total alkalinity is not less than 0.4 to 1. It may be possible to use sodium nitrate at higher pressures but we do not have sufficient data to be sure of this at the present time.

Tannic acid and sodium nitrate had previously been found by Straub to have inhibiting properties.

Further experience with these inhibitors is necessary to demonstrate their effectiveness in actually protecting boilers and to determine finally the quantities required. The figures given are the reported experimental results—not an operating recommendation.

Thus, we have two apparently effective and perfectly practicable inhibitors, each of which is in use today in many boilers with no known objectionable results. Methods of analysis for determining their concentrations in boiler waters have been developed. Proof of their effectiveness in protecting boilers will require a much longer time, although statistics of locomotive repairs on one railroad indicate that sodium nitrate is highly successful.

PHOSPHATE ALKALINITY

Another and very interesting approach has been put into use at some plants, namely, the prevention of embrittling tendencies of the water by a direct method, that is, elimination of all alkalies which will yield sodium hydroxide when the boiler water is concentrated. This is done by utilizing phosphate alkalinities only. The reasons for this are somewhat involved but are generally agreed upon by chemists, and the

[4] The forms known commercially as Argam, also known as Crown Brand (Tannin Corporation of America, Wilmington, Del.), and Supremo or Luna Brands (International Products Corporation, 90 West Street, N. Y.) have given the best results.

method has been found successful, as measured by the detector, in four plants. This is probably the most practicable way to prevent embrittlement in high-pressure plants using little make-up water. This treatment should not be confused with previous attempts to use sodium phosphate as an inhibitor in the presence of sodium hydroxide.

WIDE INTEREST IN RESEARCH

Seldom has a research project in the power field been of interest to as many engineers as has this one. Although at certain stages of the work there may have been some confusion because of contradictory findings and opinions by different investigators, such differences have at least been clarified if not eliminated. The Bureau work has been summarized.[5] A second Bulletin now in preparation will cover the last two years of work, particularly that dealing with inhibitors.

RESEARCH CONTRIBUTIONS

Contributions both technical and financial have been made by individuals, utility companies, boiler manufacturers, industrial concerns, feedwater-treatment specialists, railroads, educational institutions, and associations representing the boiler manufacturers, the casualty and surety underwriters, the railroads, and the electrical industry. The U. S. Bureau of Mines has contributed much in personnel and facilities.

The subcommittee directing the work consists of Alex D. Bailey, R. C. Bardwell, R. E. Hall, W. A. Hough,[6] D. B. Keyes, W. I. Cantley,[7] G. M. Magee,[7] E. B. Powell, S. T. Powell, T. E. Purcell, J. B. Romer, and J. H. Walker, chairman.

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[6] Mr. Hough, in 1942, succeeded Capt. Reuel C. Stratton who resigned when he entered active service. Mr. Hough represents the National Bureau of Casualty and Surety Underwriters.

[7] Representing the Association of American Railroads.

E.C.P.D. COMPLETES TENTH YEAR

1942 Annual Meeting Finds Council Facing Problems of the War

AT THE annual meeting of the Engineers' Council for Professional Development, R. E. Doherty, president, Carnegie Institute of Technology, was re-elected chairman. The meeting was held on Sunday, October 18, at the Engineering Societies Building in New York, and was followed by a dinner, at the Engineers' Club, to which members of the governing boards of the constituent societies had been invited to listen to résumés of the annual reports of the Councils' committees. A feature of the dinner was a tribute to R. L. Sackett who retired following ten years of service as chairman of the E.C.P.D. Committee on Student Selection and Guidance.

Other officers elected at the meeting were: S. D. Kirkpatrick (A.I.Ch.E.), vice-chairman; A. B. Parsons (A.I.M.E.), Secretary; and S. L. Tyler (A.I.Ch.E.), assistant secretary.

Members of the Council appointed to serve for the term 1942–1945 were: George W. Burpee, R. L. Sackett, O. W. Eschbach, Chas. F. Scott, and C. M. A. Stine (all reappointments); and A. F. Greaves-Walker (A.I.M.E.) and D. B. Prentice (S.P.E.E.), new appointments.

Chairmen of the committees of the Council were announced as follows: A. R. Cullimore, Committee on Student Selection and Guidance; D. B. Prentice, Committee on Engineering Schools; Everett S. Lee, Committee on Professional Training; Chas. F. Scott, Committee on Professional Recognition; and E. H. Robie, Committee on Information.

Members of committees appointed to serve for the term 1942–1945 are:

Student Selection and Guidance: A. R. Cullimore and G. B. Thomas (reappointments) and W. B. Plank.

Engineering Schools: J. W. Barker, E. L. Morland, and B. M. Woods (reappointments).

Professional Training, G. B. Holderer (new appointment) and John C. Arnell (reappointment).

Professional Recognition: N. W. Dougherty, Webster N. Jones, and George A. Stetson.

Information: F. A. Lewis, to succeed G. Ross Henninger.

R. E. DOHERTY REPORTS TO COUNCIL

In his report to the Council, R. E. Doherty, chairman, said that E.C.P.D. had not escaped the pressures of war and the prospects were that it would feel them still more. It was his opinion that the Council should take an aggressive position and "pursue at an accelerated rate every activity, within its charter, that gives promise of supporting the war effort or that would lay foundations of professional development that may now appear to be essential for the most effective service to the country by engineers and the engineering profession in peacetime reconstruction."

Mr. Doherty reviewed two general avenues of approach to the accomplishment of its objectives of professional development. One was to cultivate among constituent bodies an attitude of co-operation and an improved practical facility in taking joint action. The other was an educational campaign "to inform the individuals among the boards of direction and the memberships of the several constituent bodies—indeed, all engineers—with respect to the purposes and activities of E.C.P.D. and to encourage them to have an active interest."

Although the problem of reaching individual engineers was more complicated than that of reaching the constituent bodies themselves, he said, nevertheless the main elements of necessary machinery were in existence. "The channels of flow from the Council to such individuals are the national organizations of the constituent bodies. In all major cities and industrial centers there are local branches or sections of the national organizations; and on the campuses of most engineering schools there are student branches . . . . It remains to organize at such centers, where the organizations do not already exist, joint groups in which activities relating to professional development can be centered, and which, through local branches or sections, can be in communication with E.C.P.D. through the national organizations." Such a plan, he continued, was essential and he and J. F. Fairman had undertaken to formulate the details of it.

Mr. Doherty then outlined the work of the standing committees, and his comments follow.

STUDENT SELECTION AND GUIDANCE

The selection of students who are intellectually qualified and the guidance of such students into the engineering profession now represent one of our most critical problems. Normally, it is a problem of basic importance that the aptitudes of students yet in high school be determined. But this problem becomes critical in the war effort which demands more full-fledged engineers and that everybody, including students, be placed where they can render the most service. Then these students could be properly selected and guided. The expensive and insufficient facilities for engineering education must not be wasted upon so many students who cannot make the grade. And the only hope now apparent of solving this problem is the further active development of the distinguished work Dean Sackett's Committee on Selection and Guidance has already accomplished. He has laid a sound foundation of procedure in connection with the knotty problem of selection—of determining aptitude. After the exploration of earlier years, studies that have been made during the last two with the very substantial support of President Cullimore have apparently begun to open the way to the solution of this problem. And in guidance, from the experiments sponsored and studied by Dean Sackett's committee in a number of urban centers, notably New York, have emerged procedures that constitute the beginning of a solution of this difficult problem. I would urge upon you my belief that the work of this committee probably represents our most important immediate opportunity.

And I cannot leave this matter without expressing to Dean Sackett, on behalf of the Council, a deep and enduring gratitude for the foundation he has laid under this important work during a whole decade of patient, unremitting, unsung toil, and until the last year or two with practically no funds at his disposal. And I hope that as he now retires from the committee he will find satisfaction in both a job well done and the gratitude of his colleagues in E.C.P.D.

ENGINEERING SCHOOLS

The problems of the Committee on Engineering Schools are increasing in both difficulty and scope. War pressures raise questions not alone as to modification of the accrediting program; it now appears that the whole structure of higher education, including engineering, may be torn apart for the duration. What the engineering profession, as represented by E.C.P.D., can do to hold to a minimum this impending devastation and to

lay such foundations as fall within the Council's scope for post-war reconstruction of engineering curricula, is a problem with which the Committee on Engineering Schools, presumably, must deal. And as Chairman Prentice of the committee has indicated, there may be also an opportunity of assisting in some way in connection with war plans in the engineering colleges. Hence it seems very clear that although the accrediting program itself will be suspended, the efforts of this committee should not be relaxed, rather should they be redirected to the war problems.

In this general connection I would report that the Executive Committee undertook to explore the problems created by confused authority and policy in connection with professional engineering manpower in the war effort, and with this purpose in mind organized a meeting held in New York on September 20. The group included Dr. E. C. Elliott, chief, Professional and Technical Division, War Manpower Commission, Dr. Leonard Carmichael, director of the National Roster of Scientific and Professional Personnel, L. Austin Wright, assistant director, Canadian Selective Service, and a few representatives of war industries, in addition to the Executive Committee and others associated with E.C.P.D., including the national secretaries. After a period of general discussion, Dr. Elliott appointed the entire group as a special committee of his division of the War Manpower Commission, and as such it passed a resolution to be reported at the meeting today.

PROFESSIONAL RECOGNITION

The Committee on Professional Recognition has had from the beginning a thorny and uncertain path. As Professor Scott, its present chairman, has reported, the decision was reached a few years ago that the profession was not yet ready, not sufficiently like-minded, to settle upon formal criteria of recognition, and that therefore the committee's work should be redirected toward an educational program regarding the profession, reaching college students and junior engineers. Thus would a more unified understanding of the Profession be cultivated and the foundation laid for future action regarding the problem of professional recognition. Professor Scott's pursuit of this wise change in committee policy is to be commended, for I venture to say there are few students and junior engineers and probably no engineering teachers who have not felt the touch of his campaign, about which he has given full report.

PROFESSIONAL TRAINING

The Committee on Professional Training has taken a new lease on life. Under its energetic chairman it has cleared its mind as to purpose, settling upon the preparation of a "Manual for Junior Engineers" as its primary undertaking, at the same time carrying forward as far as may be practicable under war pressures other important, but secondary, projects; and this I believe to be a wise plan. The new manual will be as important to junior engineers as the pamphlet "Engineering as a Career" is to high-school and college students, and we must now make financial plans for its publication so that no time will be lost when the manuscript is ready. It is now approaching the end of the planning stage. Recalling the long hunt for outside funds for publishing "Engineering as a Career," I wish to prepare now for the manual and am recommending herein appropriate action.

ETHICS

The Committee on Ethics, which had been organized under the late American Engineering Council, came to E.C.P.D.'s sponsorship about two years ago. Under the leadership of Prof. D. C. Jackson the committee has succeeded in the difficult task of formulating a code and a "Statement of Faith" that at least have the unanimous approval of the committee. The importance of such documents to the profession, if generally accepted, needs no argument here. Moreover, I need not remind you of the extended and careful thought that these documents have had. Hence it is my hope that the Council may see fit to approve them.

INFORMATION

The Committee on Information under the chairmanship of G. Ross Henninger, has followed the customary policy of a number of years with respect to publicity of merely reporting the facts regarding actual work of E.C.P.D. and results accomplished. In addition it has carried out the special assignment during the last year of re-editing and printing the pamphlet "Engineering as a Career," which has been warmly received by the schools and colleges.

WAYS AND MEANS

Our situation is sound. Against the proposal to support the work of the Committee on Selection and Guidance that has significance in war as in peace, to finance the publication of the "Manual for Junior Engineers," and to protect the Council's responsibility for restoring the list of accredited curricula after the war, the Council has a substantial balance, as indicated on the financial statement. I have recommended that appropriate amounts be set aside now as special reserves for these purposes. Then against the regular expense budget for the year 1942–1943 submitted today for your approval, is an adequate income from The Engineering Foundation and constituent bodies. I am gratified to report that the Foundation has already appropriated for 1942–1943 a sum of $5000, an increase of $500 over last year. I have expressed the Council's appreciation both to the Foundation for its continuing interest in E.C.P.D.'s work, and to Dean Potter for his good offices in supporting the Council's request. And there is every indication that the several appropriations from the constituent bodies for the year just closed will be renewed in full for the coming year, and for this, of course, we are most grateful.

Last year when it was decided to abolish the fees collected from colleges for reinspection of accredited curricula, it was necessary to obtain new funds. The chairman was authorized to seek the funds from the constituent bodies. The A.S.M.E., A.I.E.E., A.S.C.E., and A.I.Ch.E., responded by doubling their respective appropriations, and the problem was thus solved.

CONSTITUENT BODIES REPORT

A customary feature of E.C.P.D.'s annual meetings is a report from each of the constituent bodies on what has been accomplished during the year with suggestions as to how the Council could better approach its objectives. Abstracts of these reports for 1942 follow.

AMERICAN SOCIETY OF CIVIL ENGINEERS

On behalf of the American Society of Civil Engineers, E. E. Howard read from a report by R. E. Bakenhus. The report said that the A.S.C.E. had endeavored continuously to uphold the policies of the E.C.P.D., particularly in its accrediting program. This was done in part through student-chapter organizations. The A.S.C.E. representatives on the Council were proud to report the continued activity of the New York Engineers' Committee on Student Selection and Guidance, which for the past five years had been under the chairmanship of an A.S.C.E. member, Arthur G. Hayden. This committee was made up of members of the five engineering societies participating in E.C.P.D., the civil engineering subcommittee consisting of 20 members. Mr. Hayden's report for 1941–1942 had stated that

28 group meetings and three general assemblies had been held in the high schools of New York City, at which more than 7000 students had been in attendance.

Representatives of A.S.C.E. had attended the conference with the War Manpower Commission held under the auspices of E.C.P.D. on September 20. Although A.S.C.E. had expressed no formal opinion, it might be stated that "the Society thoroughly endorses the stand: First, that every effort should be made to supply the armed services with engineers of the type that are required and in the tasks that require engineers; second, that every effort be made to supply necessary and vital industrial establishments with engineering talent for use in the tasks where it is necessary; and third, that the supply of trained engineers be kept up as the war needs indicate."

As to what E.C.P.D. might do, the report called attention to the expressed desire of the A.S.C.E. Board of Direction "that E.C.P.D. might well limit its work of accrediting curricula to the five major fields of engineering." The report also stated that "any steps in the direction of greater solidarity of the profession and greater effectiveness in dealing with technical, social, and economic problems, particularly in these times when the country is under great stress due to the war and social changes, would be desirable."

NATIONAL COUNCIL OF STATE BOARDS OF ENGINEERING EXAMINERS

Reporting for the National Council of State Boards of Engineering Examiners, N. W. Dougherty expressed pleasure that the distribution by E.C.P.D. of Wickenden's "The Second Mile" (an abstract of this article was published in MECHANICAL ENGINEERING, April, 1941, pages 297–299, under the title "What Is A Profession?") was well under way, that a guide for senior students and junior engineers was being prepared, and that a "code of ethics" has been written, as these projects all concerned N.C.S.B.E.E.

E.C.P.D., said Mr. Dougherty, had been organized to enhance professional status. Four phases of a continuing program of procedure for promoting E.C.P.D. objectives were: (1) Better practitioners, about which N.C.S.B.E.E. had done much; (2) co-operation of the different engineering agencies, about which they had done little, except as something had been done through overlapping of memberships; (3) recognition on the part of engineers that they are members of a profession; and (4) public recognition that engineers deserve a place of esteem about which much was yet to be done.

THE ENGINEERING INSTITUTE OF CANADA

The report on behalf of The Engineering Institute of Canada was presented by C. R. Young, president of the Institute. Under the direction of the Institute's Committee on Training and Welfare of the Young Engineer, a pamphlet entitled "The Profession of Engineering in Canada" had been printed and 9000 copies distributed without charge to the engineering colleges and to each of the secondary schools of Canada where the instruction is given in English. A French language edition of the brochure was now in the hands of the printers.

Student-guidance committees had been set up in 16 of the 25 branches of E.I.C. in Canada, and the remaining nine branches were preparing to name similar committees. Favorable comment on the work of student guidance had been voiced and the Institute had been commended for its action. Arrangements were being made to distribute the E.C.P.D. manual for committees who aid young men interested in engineering education and the engineering profession to all counseling committees of the Institute.

It was planned, he said, that the E.I.C. Committee on the Training and Welfare of the Young Engineer would expand its activities in the direction of the training of the young engineer following graduation. Steps to foster competition of student and junior members for prizes offered by the Institute had been taken.

The Institute had also created a sentiment for the greater solidarity of engineers in all that is essential to their professional life.

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

Dean R. L. Sackett presented the report of representatives of The American Society of Mechanical Engineers, who are A. R. Stevenson, Jr., and H. T. Woolson, in addition to Dean Sackett. The report follows:

This Society has two committees which co-operate with E.C.P.D. in furthering its programs.

The Committee on Relations With Colleges is charged with the supervision of the 120 student branches of the Society. Copies of the address by President Wickenden entitled "The Second Mile" were sent to each student branch chairman and honorary chairman with a letter suggesting the use of the address as the basis for student and faculty programs.

The Committee on Local Sections sent to each section chairman a reminder of the need for local guidance in the high schools for those boys who were interested in an engineering education. Only five sections out of 22 answering the inquiry had organized guidance committees.

If the experience of other societies is similar, it indicates a low interest in civic affairs and in the future status of the engineering profession.

It is desirable that Society committees in charge of local sections and student chapters or branches should promote the efforts of E.C.P.D. which are designed to encourage, inform, and help members and prospective members. Society publications provide reviews of E.C.P.D. meetings and the programs of committees but local-section and student meetings give scant attention to subjects of immediate concern to the progressive individual.

The Committee on Education and Training for the Industries held two sessions at the Cleveland Meeting, June 8–10, 1942, on "Education and Training for Industry Before and After the War," "Co-operative Education," and "Looking Ahead in Adult Education."

At the Rochester meeting, October 12–14, 1942, "Training Women for Engineering Jobs" was discussed by Mrs. Lillian M. Gilbreth, A.S.M.E., and others, and a panel discussion on "Education for Industry" was held.

The A.S.M.E. has increased its appropriation for the support of E.C.P.D. to $1700 for the year.

It is understood that leadership is woefully lacking in candidates at Officers Training Camps; the same qualities or similar abilities are needed in industry, which finds them difficult to discover. E.C.P.D. has discussed the subject since in its objectives it is authorized to co-ordinate and promote efforts and aspirations directed toward "greater effectiveness in dealing with technical, social, and economic problems."

One way for E.C.P.D. to help in accomplishing this purpose would be to ask the education committee of each constituent society to put on programs designed to inform the engineering profession concerning social problems and its responsibility in solving those particularly to which it has contributed. Leadership depends on the engineer's sensing the part he has played in creating social and economic problems, and applying his intelligence, jointly with other forces, to the improvement of labor relations and human understanding of the conditions involved.

THE SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION

Reporting for the Society for the Promotion of Engineering

Education, C. C. Williams said that "the activities of S.P.E.E. for the year have been directed toward rendering the colleges of engineering maximally useful in the war effort. The effectiveness," he said, "has been hampered by two circumstances: (1) A lack of up-to-date comprehension at Washington of the distribution and potentialities of the technologic and research activities in the universities, and (2) a lack of knowledge on the part of engineering educators of the technical needs of the war effort."

"In the present disturbed state of engineering education," he concluded, "it seems likely that E.C.P.D. may well devote its attention to the relations of the engineering profession to the war effort and allow engineering education to find its own way. The exigencies that will arise in the colleges of engineering will have to be handled by the individual institutions in view of their own conditions and by organizations in S.P.E.E. and other associations most immediately concerned with educational administration. When engineering education begins to enter the period of postwar adjustment, E.C.P.D. may well give thought to the part that undergraduate and graduate education have in the comprehensive project of professional development."

AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS

In presenting a report on behalf of the American Institute of Mining and Metallurgical Engineers, W. B. Plank told of a special committee of the Institute which "has made a preliminary report outlining a plan whereby, mainly through local sections, special attention will be given to new engineering graduates, to make them acquainted with other young engineers and to make it possible for them to participate both technically and socially in local-section activities."

He mentioned also a committee which has made a study of the Selective Service as it affects young mining and metallurgical engineers. Through advice to deans of schools and correspondence with Selective Service officials, and later with the War Manpower Commission, the committee had been instrumental in clearing up many questions.

A second edition of a booklet by T. T. Read, "Careers in the Mineral Industries," had been issued during the year. Also during the year the A.I.M.E. had sponsored publication of a notable book by T. T. Read, "The Development of Mineral Education in the United States."

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS

After reporting that he fully expected favorable action on the part of the Board of Directors of the American Institute of Electrical Engineers on the request for continuance of an increased appropriation for the work of E.C.P.D., J. F. Fairman, speaking for A.I.E.E. representatives, told about the presentation of an address, "What the Sections Can Do to Assist E.C.P.D.," delivered at the 1942 Summer Convention of the Institute.

"During the year," Mr. Fairman continued, "we have reviewed the situation as to the existence of student branches of the Institute at institutions whose curricula in electrical engineering were not accredited by E.C.P.D. In 1940 there were eleven cases. In 1941 there were seven. If Council approves the recommendations of its Committee on Engineering Schools, after this meeting there will remain only five. This seems to indicate progress and a definite effort on the part of the schools to get themselves on the accredited list."

As to suggestions for the work of E.C.P.D., Mr. Fairman said, "Our own opinion . . . is that E.C.P.D. would do well to concentrate on its immediate objective and to avoid the temptation to adventure in broader fields."

AMERICAN INSTITUTE OF CHEMICAL ENGINEERS

B. F. Dodge, speaking on behalf of the representatives of the American Institute of Chemical Engineers, applauded the E.C.P.D. for its resolution of September 20 on the subject of manpower. He said that the demand for chemical engineers greatly exceeded the supply. Inasmuch as chemical engineering was a young man's occupation, there was no pool of older men upon which to draw. It was his opinion that the place of the chemical engineer was in the production army. He was thankful that there were no outstanding differences between the A.I.Ch.E. and E.C.P.D. The A.I.Ch.E., he said, had 5000 student members.

E.C.P.D. ANNUAL DINNER

Colonel C. E. Davies, secretary A.S.M.E., acted as toastmaster at the annual dinner of E.C P.D. which was held at the Engineers' Club, New York, N. Y., on Sunday evening, October 18, following the annual meeting of the Council. In addition to members of the Council and its committees there were also present at the dinner representatives of the governing boards of several of the constituent bodies.

Colonel Davies recalled how the E.C.P.D. had been formed following a "Conference on Certification" held ten years ago. A profession, he said, was nothing without ideals, ideas, and leaders. We had to be realistic about the engineering profession and to realize that we had hardly started to build a profession of engineering. A wide range of viewpoints existed which had to be considered. E.C.P.D. had started in 1932 as "a conference of engineering bodies," and its purpose was to suggest to operating groups what should be done. In order to have leadership, he continued, acquaintanceship was essential, and such gatherings as the one he was addressing were a means to such an end. The ten years of E.C.P.D.'s activities had, in his opinion, been worth while, and he proposed to call upon representatives of E.C.P.D. committees to tell briefly what E.C.P.D. was thinking about.

Colonel Davies then called upon Chas. F. Scott, Committee on Professional Recognition; D. C. Jackson, Committee on Ethics; S. D. Kirkpatrick, Committee on Engineer Training; D. B. Prentice, Committee on Engineering Schools; and R. L. Sackett, Committee on Student Selection and Guidance, who spoke briefly of the work of their committees. As the reports of these committees have been summarized elsewhere in this account of the E.C.P.D. annual meeting, no attempt to repeat these reports will be made here.

TRIBUTE TO DEAN SACKETT

Following Dean Sackett's brief address, the toastmaster called upon George A. Stetson to report for a special committee which had been appointed to prepare a tribute to Dean Sackett who retires from the chairmanship of the Committee on Student Selection and Guidance after a service of ten years. After reviewing the importance and significance of the work of this committee under Dean Sacketts' leadership, the tribute read:

"We have listened today to the report of one of your committee chairmen who has lived through this period of evolution. Long years of service in the field of engineering education have matured his wisdom and judgment. Experience with several generations of youth, with practicing engineers, and with the men and women of this nation has been his in rich measure. Some inner quality of alertness to men and events has kept his mind youthful and his vision clear. Although justified by years and the value of his accomplishments in enjoying the leisure that the vigor of his health would make a pleasure rather than a burden, he has preferred to pioneer in the field of selection and guidance of young engineers, and has de-

voted his time and energy to a new and important aspect of engineering education upon which the quality of future generations of engineers will indubitably depend. To the professional social scientist and the pedagogical psychologist he is a layman; but those who have known him and worked with him recognize that new ideas in any field coalesce into the substance of practicability when exposed to the influence of his maturity and experience.

"Dean Sackett, it is my privilege to extend to you on behalf of this group of your friends and fellow workers their congratulations and their tribute to you for your service in the field of engineering education and particularly for your ten years of leadership in developing the techniques of selection and guidance of engineering students. As your studies bear fruit in application in education and engineering, more and better leaders will be developed and a larger and more intelligent group of young men will rally to wise leadership. You cannot pass on to them your maturity and experience; but, when peace returns, following your example and aided by the influences you have set in motion, they will be able to distinguish between true leadership and false, bring education to serve the liberties and well being of mankind, and build a nobler profession that will be the master and not the victim of applied science through a wise use of maturity and experience."

In his response Dean Sackett, to whom the tribute had come as a complete surprise, said that his service on the committee had been a pleasant experience in spite of the resistance he had encountered. In such a post a certain amount of mulishness was necessary. Many times, he confessed, he had not known whether he had been kicked downstairs or up. He had not been indifferent but ignorant of having been rebuffed.

Following the tribute to Dean Sackett, F. L. Bishop, secretary S.P.E.E., called attention to the fact that normally the work of E.C.P.D. and the engineering colleges had to do with students who had the financial backing necessary for getting an engineering education. When the Army and Navy take over, he said, twice as many young men would be able to enter engineering colleges as had been the case under normal conditions.

CANADIAN ENGINEERS COMPLIMENT E.C.P.D.

Calling attention to the fact that The Engineering Institute of Canada was the only constituent body which had sent its full delegation of representatives to the E.C.P.D. annual meeting, Colonel Davies asked Arthur Surveyer to speak for the E.I.C. representatives.

Mr. Surveyer said that he was attending his first E.C.P.D. annual meeting. He had, he said, a feeling of pride that The Engineering Institute of Canada had been asked to become one of the constituent bodies of E.C.P.D. E.C.P.D., he recalled, had worked relentlessly to improve the status and education of engineers and to guide high-school students.

Appraisal of aptitudes for a profession was important, he said. No other profession, in his opinion, had given so much thought to the question of selection or had gone so far in saving young men from the disappointment of making a wrong choice. Lawyers and doctors, he pointed out, remained practitioners throughout their lives, while engineers usually advanced to administrative positions. In this advancement the engineer generally had to discard the practice that had helped him to rise. It was his habit to look for fine qualities in men and to help their development.

It was difficult for laymen, he said, to understand how a group of men having such differences of background and function as engineers exhibit could constitute a profession. However, professionalism for engineers was an attitude of mind, an ability to analyze and to sift essentials from nonessentials.

It was now necessary for engineers to assist in winning the war and the peace which was to follow. No men, Mr Surveyer concluded, were better trained than the engineers of the United Nations. With the discipline of their education they should participate in the bringing of peace.

J. B. Challies, also of the E.I.C., followed Mr. Surveyer and spoke briefly. He had had something to do with the suggestion that E.I.C. be associated with E.C.P.D. Engineers in Canada were not separate, and they appreciated being members of the "Supreme Court of Organized Engineering in North America," the E.C.P.D.

MANPOWER CONTROLS IN CANADA

In introducing L. Austin Wright, secretary of The Engineering Institute of Canada, Colonel Davies said that he had been impressed with manpower controls in Canada. Mr. Wright was deputy director of National Selective Service in Canada, under Elliott M. Little, director, also an engineer, to whom the job had been given because of the success which had attended his handling the Wartime Bureau of Technical Personnel organized by three Canadian engineering societies.

Mr. Wright described briefly but clearly the operation of the National Selective Service system in Canada and the controls of manpower that are exercised there. He also told about the control of engineering students and their allocation upon graduation, to the armed forces and to industry. Students in Canadian universities were permitted to finish their courses, he said, and in the case of engineering students, summer work in industry was required, inasmuch as the courses were not "accelerated" as they have been in the United States. No more postgraduate courses are offered and one failure would be sufficient to remove a student from school. Changes of courses were not permitted students, unless the changes were in the national interest. All students were to be called up for active service upon graduation and those physically unfit for military service would be required to take positions in industry. Allocation of graduates to the armed forces and industry was under the control of the National Selective Service and was carried out in accordance with national need. It was planned, he said, to carry the control back to the high schools in order to provide an adequate supply of college-trained men for the armed forces, the government, and industry.

OFFICE OF TECHNICAL DEVELOPMENT

Webster W. Jones, dean of the College of Engineering, Carnegie Institute of Technology, reviewed informally the survey made for the War Production Board which resulted in the recommendation that a group of engineers and scientists be set up as an Office of Technical Development. The Office, he said, would be advisory to Donald M. Nelson, War Production Board director.

PRESIDENT-ELECT H. V. COES SPEAKS

Asked by Colonel Davies to speak to the Council, H. V. Coes, president-elect of The American Society of Mechanical Engineers, said that he had followed the work of the E.C.P.D. with interest for several years. It had set a pattern for cooperative efforts of engineering groups which too often conducted their affairs in such "airtight compartments" that they lost track of their objectives.

In bringing the dinner to a close, President Doherty said that it was heartening to the officers of E.C.P.D. to see the interest taken in its affairs and discussions. He appreciated the spirit of the discussions he had just listened to and the help of our Canadian colleagues. We could, he said, face the coming year with encouragement and determination to aid in the war effort.

—G. A. S.

REINVESTMENT OF CORPORATE EARNINGS[1]

By DONALD S. TUCKER

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

THE reinvestment of corporate earnings has been a topic of debate in scientific works as well as in political life. Twice within the life of the present generation the bulk of scientific opinion has been substantially reversed. Texts and scientific articles have therefore presented apparently three conclusions within twenty years.

If these reversals of opinion by serious writers had represented mere caprice or instability, these changes could be disregarded; but such is not the case. These changes of opinion correspond rather (*a*) to changes in the external world of fact which controls or conditions business operations, and (*b*) to the development of a more penetrating analysis. Even though the conclusions of today may resemble superficially those of twenty years ago, the modern opinion is more precisely qualified and is less naive than that of former years. The books to be reviewed in this issue indicate the development of greater sophistication with respect to corporate dividend policy.

Because it is impossible within brief space to give credit to all the men who have contributed to our knowledge or even to name the chief contributors, the books selected for mention here are few in number. Selections have been based solely on the clarity and excellence of the exposition. It is mere coincidence that the authors selected for mention here have been also important contributors to our knowledge.

The naive view of twenty years ago with respect to corporate dividend policy was based chiefly on two elements—the desirability of preserving a corporation's credit and the desirability of expanding the country's industries. A typical recommendation of this period would have been in favor of paying a dividend only as large as could be maintained in bad times as well as in good. Since corporate earnings are highly variable, such a policy, if maintained for some years, would result in the reinvestment of a large portion of all corporate net income. Such reinvestment was regarded as both desirable and proper.

In line with this policy Dewing[2] in his earlier editions points out that the sale of additional securities is facilitated by the payment of a regular dividend. If two kinds of stock are outstanding, full payment of the preferred dividend is normally desirable when earnings permit; but he then cited with unqualified approval the refusal of the Union Pacific Railroad to pay its full preferred dividend for several years after its reorganization. During this first period, then, emphasis was placed primarily on the businessman's difficulties in meeting business risks.

Texts on investment policy, even more positively than texts on corporation finance, were disposed in those earlier days to praise a conservative dividend policy. Fifteen years ago an investor was supposed to buy bonds, rather than stocks. Conservatism in corporate dividend policy is clearly advantageous to creditors. The text[3] on investments then most popular in its edition of that period devoted only a single paragraph to dividend policy and offered only one conclusion. "The investor should assure himself that dividends are paid only after earnings prove sufficient to maintain the plant, pay all fixed charges and to provide a conservative reserve for contingencies." Such conclusions are excellent as far as they go; but, like all other discussions during this earlier period, they fail to recognize the complexity of the problem.

The second stage in the development of the theory of dividend policy resulted from two changes of fact and from certain contributions by economic analysts. The two changes of fact are easily noted. (1) The incidence of investment losses, 1929–1932, made it obvious that the typical American investor was a stockholder as well as a bondholder. Many people who had never borrowed money nor bought a single stock on margin, suffered severely from the decline of dividend income. Investment texts began therefore to devote more attention to stock as an investment. (2) During the nineteen-thirties great increases in the rates of surtax on personal incomes made the reinvestment of corporate income highly attractive to many corporate managements as a method of evading or postponing the taxes on their personal incomes. Prior to this period our federal tax structure had been criticized for its double taxation of the income produced by corporations; but after 1934 an increase of personal taxes more rapid than the increase of taxes on corporate income, operated to render incorporation desirable and to make the reinvestment of corporate income attractive as a method of diminishing total tax liability.

Of the various discoveries contributed by analysts, the first was the most startling. Improvements financed by the reinvestment of corporate earnings were in general distinctly less profitable for investors than those financed through the issue of new securities. Dewing[4] in his third edition, for example, calls attention (page 936) to the extent of this difference in the case of textile mills, though he is not yet ready to reverse his general position on dividend policy. Investment studies by others subsequently have tended to confirm the existence of this difference; but there has been as yet no comprehensive measurement of its precise magnitude and no satisfactory determination of the causes of a discrepancy apparently so large. Some have suggested that improvements financed by the reinvestment of corporate income escape the scrutiny of investment bankers and that this scrutiny is valuable to the corporation as well as to investors; but the more common suggestion is that funds secured through the reinvestment of earnings are received in small, irregular installments and tend therefore to be frittered away in small improvements. They are not available for building in a new location an additional plant of the right size and of modern design. It is to be hoped that the next decade will bring forth more studies of this problem

A more fundamental line of attack was taken by Graham and

[1] One of a series of reviews of current economic literature affecting engineering prepared by members of the department of economics and social science, Massachusetts Institute of Technology, at the request of the Management Division of The American Society of Mechanical Engineers. Opinions expressed are those of the reviewer.

[2] "The Financial Policy of Corporations," by A. S. Dewing, New York, N. Y., 1920.

[3] "The Principles of Bond Investment," by L. Chamberlain and G. W. Edwards, New York, N. Y. 1927.

[4] "The Financial Policy of Corporations," by A. S. Dewing, Ronald Press, New York, N. Y., 1934, 1270 pages, $10.

Dodd[5] in the early thirties. They pointed out that the only return received by stockholders from the earnings reinvested by corporations lay in future dividends larger than would otherwise have been possible. Reinvestment policies, when tested by this criterion, were startlingly defective. The reinvested earnings of U. S. Steel, for example, during the period 1901–1930 amounted to 1250 million dollars. Losses after preferred dividends for the eighteen months after January 1, 1931 were only 59 millions. Dividends were nevertheless suspended. "A year and a half of declining business was sufficient to outweigh the beneficial influence of 30 years of practically continuous reinvestment of profits."

In the 1940 edition[6] of their work Graham and Dodd state still more positively the doctrine already accepted in substance by Williams[7] and others that "a compulsory surplus is an imaginary surplus." To stockholders who are not part of the management, the only benefit to be received from the ownership of stock consists of the dividends. Regularity of dividend payment is valuable to stockholders only if it can be secured without appreciable sacrifice by stockholders in the total amount of the dividends received. Graham and Dodd also note that "the earnings that are not paid out in dividends have a tendency to lose part of their effective value for the stockholder."

Such emphasis on the wisdom of a liberal dividend policy is impressive because Graham and Dodd's book is now perhaps the most widely used of the various texts on investment policy; but more was still to come. In 1941 Dewing published the fourth (and by far the best) edition[8] of his text. In this he states flatly that "it is more fair, more honest, for the directors to distribute the surplus earnings, not needed in the business, and then to appeal to the shareholders for the new capital required to carry out a policy of expansion."

Because Dewing is writing for the financial administrator, rather than for the investor, he discusses at greater length the needs of the business; but his position may perhaps be summarized as follows. Directors must withhold any earnings that are needed for preserving the corporation's solvency and its capital; but the stockholder is entitled to the free income. This new attitude toward the reinvestment of earnings is based on ethical standards and on the management's duty as a fiduciary. The analysis of business risks is improved, and the businessman's problem in meeting such risks is stated with greater clearness. In spite of this improvement in the analysis of the manager's problems, an even more rapid improvement in the analysis of the stockholder's position causes reversal of the balance between manager and investor.

The qualifications necessary in order to understand this development of dividend doctrine between 1920 and 1940 may be explained readily by assuming an artificially simplified set of facts. A corporation may have earned $6 per share in some fairly good year. A dividend of $1 per year could be maintained even in fairly bad years, and the payment of this $1 annually would benefit managers as well as stockholders because it would improve the company's credit. The payment of an additional $3 would be possible this year; but dividends totaling $4 per year could not be maintained, and the payment of this additional $3 would also handicap now the management's carefully planned program of expansion. The remaining $2 must be reinvested in any case in order to maintain the corporation's solvency and as a provision against future losses. In such a situation some investment analysts would maintain that the last $2 is not true income; but whether this $2 of corporate net earnings is properly called income or not, all advocates of a liberal dividend policy would either agree or insist that this $2 must be reinvested by the corporation. On the other hand, perhaps even the most fanatic advocate of a conservative dividend policy would agree that the $1 should be paid out in dividends. The $3 additional dividend that is possible this year through postponement of expansion, forms the only bone of contention. Twenty years ago the manager's wishes were paramount. Investment analysts therefore agreed with students of financial administration in advocating reinvestment of this $3. By 1941 leading students of financial administration had agreed with the students of investment policy in recommending that this $3 be paid out in dividends promptly.

The third phase of this controversy is a by-product of the war; but it involves also one additional fact. Business inventories have been enlarged greatly during the last two years. The discussion of this third phase of financial policy has appeared chiefly in books on war economics, such as the small book published recently by Brown University economists.[9] A perusal of such works leads to the conclusion that for the duration of the war the industries making goods for civilian use ought to act as ordinary civilians are now requested to act. Such enterprises therefore should use up their inventories gradually and should save their current income. Business finance, however, is more complex than personal finance, and it seems reasonable to infer from these recent discussions that business enterprises, if in debt, ought to use the income saved and the funds derived from liquidation of their inventories primarily for the reduction of their own debt. Business creditors will thus be supplied with funds available for the purchase of government bonds. There are many channels through which any money that is saved can flow into the federal treasury, if only total savings can be made sufficiently large. The curtailment of civilian spending and of nonmilitary investment is, however, essential to successful war finance.

Industries making war supplies have in many instances financed their expansion by the issue of debt. The amortization of this debt and the general uncertainty with respect to future tax liabilities may compel many of these concerns to adopt conservative dividend policies. Conservative dividend policies, if associated with debt payment by corporations, assist obviously in the curtailment of civilian spending.

For all business also the uncertainties of the war and of the postwar period create exceptional possibilities of loss. A conservative dividend policy may therefore be imperative during the progress of hostilities. The general principle governing dividend distribution is not altered; but the $2 of our previous example may well have become $4, or perhaps even $5, under present conditions. Theorists generally approve therefore of the conservative dividend policy adopted by American corporations for the duration of the war; but the theorists are now more worried than are many businessmen by the continued expansion of business inventories. Debt payment and the purchase of securities, rather than the expansion of tangible assets, is in their opinion the proper use for corporate surplus now, except only in those instances where inventory expansion is an inescapable prerequisite for the enlarged production of goods directly necessary for the war effort.

It is obviously beyond the function of this column to attempt to advise businessmen with respect to business policy. The

(*Continued on page 908*)

[5] "Security Analysis," by B. Graham and D. L. Dodd, New York, N. Y., 1934.

[6] "Security Analysis," by B. Graham and D. L. Dodd, McGraw-Hill Book Co., New York, N. Y., 1940, 830 pages, $4.

[7] "The Theory of Investment Value," by J. B. Williams, Cambridge, Mass., 1938.

[8] "The Financial Policy of Corporations," by A. S. Dewing, Ronald Press, New York, N. Y., 1941, 1499 pages, $5.50.

[9] "Introduction to War Economics," by Basch, Beatty, Bosland, Brown, Killough, Poole, Stoltz, and Taft, Chicago, Ill., 1942.

BRIEFING THE RECORD

Abstracts and Comments Based on Current Periodicals and Events

MATERIAL for these pages is assembled from numerous sources and aims to cover a broad range of subject matter. While few quotations marks are used, passages that are directly quoted are obvious from the context and credit to original sources is given.

"Heliarc" Welding

VARIOUS SOURCES

A NEW method of fusion welding, which takes advantage of the peculiar properties of helium, an inert, nonexplosive, nonflammable gas, is the result of joint development by The Dow Chemical Company and Northrop Aircraft, Inc. Of particular interest at this time of rush war production is the fact that vital aircraft sand castings, some of which were formerly discarded because they did not meet standard specifications, now can often be reclaimed by this advanced method.

As magnesium, lightest of all structural metals, is an essential material for the construction of airplanes and other military equipment, the new helium arc method for welding magnesium alloys has an important bearing on our war-production progress, according to Dow spokesmen. Its advantages over other methods of joining are the elimination of rivets, ease of operation, and greater speed of production over a wider range of design. These results are possible because the electric arc applied to the parent metal is shielded by a blanket of inert helium gas which prevents oxidation of the molten weld metal. Oxygen cannot penetrate the helium "envelope."

Contrary to popular belief, magnesium alloys are not inflammable when properly processed; in fact they are more resistant to direct flames than aluminum alloys. Although magnesium alloys are 35 per cent lighter than aluminum alloys and 21 per cent of the weight of steel per unit volume, their weight-strength ratio is comparable to aluminum alloys, and they possess the design properties of stiffness and rigidity that cannot be obtained in other alloys. With these properties of magnesium alloys in mind, together with the rapid production method of attachment and aerodynamic advantages which Heliarc welding presents, the future use of magnesium alloys for the fabrication of structures, especially in aircraft, should be greatly enhanced.

Magnesium castings containing foundry defects have been repaired with this process and welds equal to or stronger than the surrounding metal have been obtained. The weld metal is much more dense than that of the surrounding cast metal and far less susceptible to corrosion. Almost any thickness of cast metal that can be poured may be readily welded with this process.

Welding rod of the same alloy as the parent metal is usually used for castings and wrought alloys. The weld ingot appears to have better corrosion-resistant properties than the parent metal in salt-spray tests. The weld bead appears to be cathodic to the adjoining metal, which causes minor pitting of the original metal adjacent to the weld under severely corrosive conditions.

The tungsten electrode is very slowly alloyed with the weld metal and naturally in a period of time the tungsten electrode must be replaced. No noticeable increase in the corrosion rate of Heliarc welds in magnesium alloys because of the presence of tungsten has been noticed.

Heliarc weld ingots have in general an extremely fine grain with practically no grain enlargement adjacent to the bead, indicating that there is a minimum of heating effects on the adjacent metal. This accounts for the very good weld efficiencies obtained on Heliarc-welded alloys.

Dowmetal J-IH magnesium alloy, Heliarc-welded, has approximately 95 per cent of the parent metal strength in the weld area. However, at present the design safety factor for welded Dowmetal J-IH assemblies is 75 per cent of the strength of the parent metal. These strength values are based on butt-welded joints. Fillet, lap, edge, or corner welds are weaker

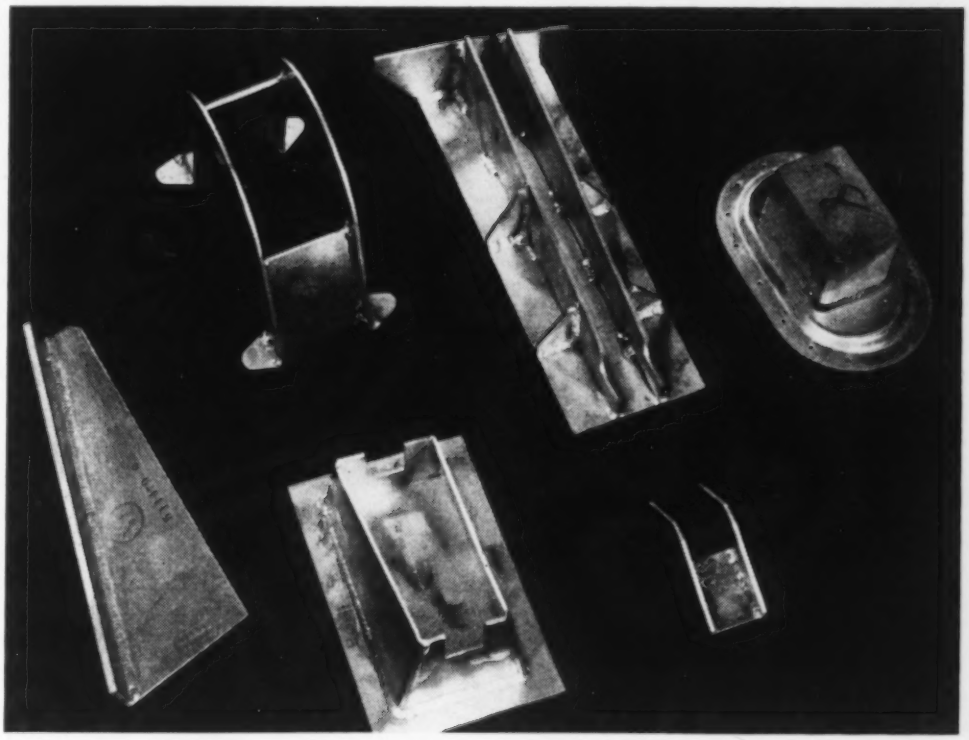


FIG. 1 EXAMPLES OF HELIARC WELDING

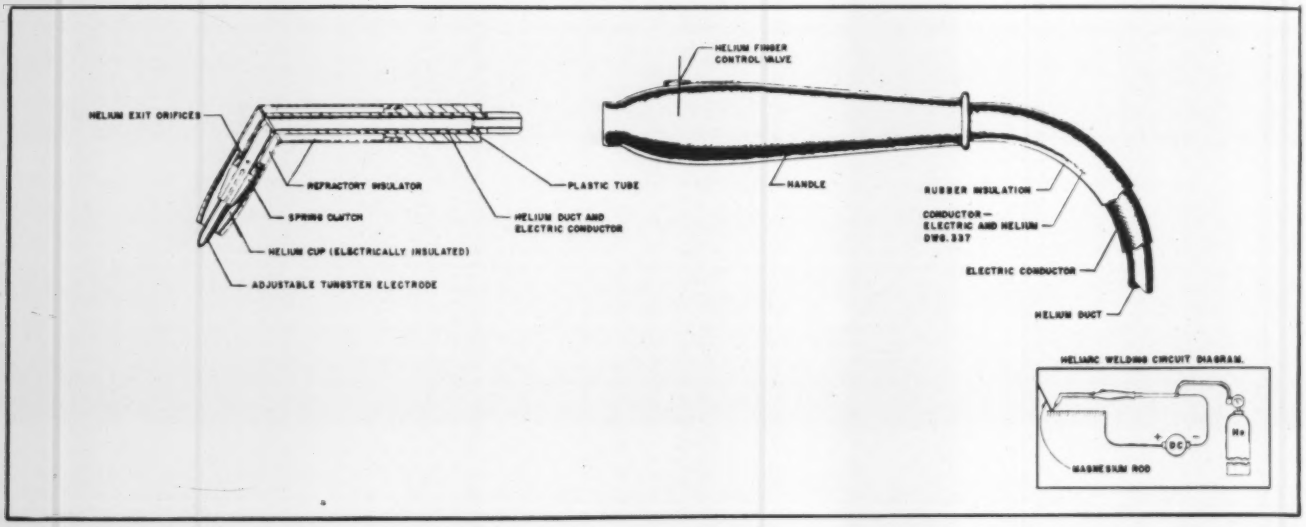


FIG. 2 THE HELIARC WELDING TORCH

than the butt-welded joint and must be stressed accordingly.

Heliarc welding has proved to be a successful medium of attachment for magnesium, stainless steel, brass, inconel, monel, and some of the carbon-steel alloys. Research work is now in progress to extend its use to aluminum and other carbon-steel alloys not heretofore Heliarc-welded. In the Heliarc welding process, a shield of helium gas envelops the molten metal. Because helium gas is an inert gas, it prevents oxidation and eliminates the use of a flux and the danger of entrapped flux in the weld ingot that would promote corrosion. The arc in this process is produced directly between a tungsten electrode and the base metal rather than between two tungsten electrodes as is the practice in atomic hydrogen welding.

The Heliarc welding torch is equipped with a helium valve that is opened just prior to the striking of the arc between the tungsten and the parent metal which feeds helium through the torch to the weld. Helium has over five times the specific heat of air and when in motion prevents heat accumulation around the weld thereby keeping it cooler and giving a better fusion and penetration with less distortion than other welding processes. The arc is struck by a slight brushing action and quickly drawn back from the metal. Northrop Aircraft, Inc., has designed Heliarc torches which will shortly be available to the industry. The torches are of two sizes to handle $^1/_{16}$ in. to $^1/_8$ in. electrode and $^3/_{16}$ in. to $^1/_4$ in. electrode respectively and may be supplied with tips of different angles 40, 60, and 90 deg. The torch may be used for pencil welding or, by extending the handle, a handle-bar grip is obtained for heavier welding. A type of torch will later be available that feeds the filler rod automatically, giving more uniform results than where the rod is fed by hand. Best results are obtained by feeding the filler rod into the tungsten electrode which melts off portions of the rod thereby casting a uniform weld ingot. This procedure has been found to be superior to the practice of feeding the filler rod into the molten pool under the arc, whereby the molten pool is not sufficiently agitated to break the crust which gathers on the surface of the pool. Since the reflected heat from the tungsten overheats the filler rod, an angle of 60 to 90 deg must be maintained between the filler rod and the electrode. The tungsten electrode varies in size from $^1/_{16}$ to $^1/_4$ in., depending upon the thickness of metal welded and the heat required.

The torch must be held as near the weld as possible to obtain maximum benefit from the helium for the prevention of oxidation. Also an arc length of 0.060 in. maximum should be maintained. Poor penetration or gas holes may result by using too long an arc. On those alloys that have a tendency to be hot short, a rapid welding speed is recommended, approximately three feet per minute, to eliminate the danger of cracking.

A conventional arc-welding machine with direct-current generator having a 150-ampere output is desirable. However, higher-output machines which operate at less than 300 amperes may be used providing lower amperes may be obtained. An upright machine is preferable in that it is easier to attach a helium tank to such a unit. Separate amperage and voltage regulators must be provided and the machines should have a continuous sequence of five increments of current control. The average life of a 200-cu ft helium tank is about thirty-five hours of continuous welding with a medium-sized torch. Fairly pure helium gas is required. Normally helium as purchased from the Government plant is sufficiently pure to cause no difficulty. Additional gases in helium such as carbon dioxide, hydrogen, nitrogen, and the hydrocarbons may cause pronounced defects. Hydrogen produces bad porosity. Oxygen films the metal causing poor coalescence and inclusions. The presence of 7 per cent nitrogen in the helium reduces the welding speed to about two thirds that obtained when only 2 per cent is present. All of these gases if present, may be removed, however, by passing the helium through filtering mediums.

This method of arc welding has provided an important new tool for the fabrication of structures from alloys such as magnesium and stainless steel. Any type of joint which has been commonly used for welding ferrous metals, may be employed on magnesium and stainless steel.

Stainless steel has heretofore been the most difficult alloy to weld and could only be satisfactorily arc-welded by the use of atomic hydrogen, and then only on thicker sections. By the Heliarc welding process, thicknesses of less than 0.010 in. may be very easily welded. In the Heliarc welding of stabilized stainless steel the extent of carbide precipitation is very low as compared to other methods of welding which greatly increases its fatigue factor.

In the Heliarc welding of magnesium structures a tungsten electrode is used with reversed polarity making the magnesium the anode. For ferrous and copper alloys, a carbon electrode is used and the welded structure is the cathode. Craters are eliminated in reverse-polarity welding.

For the high-temperature-melting and heat-resisting alloys Heliarc welding has proved successful where other welding methods failed.

Emergency Specifications

WAR PRODUCTION BOARD

NATIONAL Emergency Specifications for steel products, designed to limit the manufacture of steel-mill products to the minimum number of varieties which will satisfy current needs, were established by the War Production Board on October 23 in Limitation Order L-211.

Order L-211 establishes the authority of the Director General for Operations to issue schedules for various steel products, which limit varieties and shapes as well as set up specifications defining compositions, types, grades, and qualities of steel and steel products.

The first two such schedules, issued concurrently with the order, cover concrete-reinforcement steel, and railroad and transit service wheels and tires. Several other schedules are now being prepared.

The order, together with the related schedules, is expected to increase production by leading to the use of existing facilities in a more efficient way. At the same time, it is expected thas mill and consumer inventories will be decreased as a result of the reduction in compositions and forms needed for maintenance and replacement.

The schedule on concrete-reinforcement steel (Schedule 1) establishes a list of permissible sizes of steel reinforcing bars by adopting the Simplified Practice Recommendation R26-42 of the National Bureau of Standards as modified in accordance with recommendations of a technical advisory committee.

A list of permissible sizes of steel reinforcing spirals, as set forth in Simplified Practice Recommendation R53-32, is also established. All producing mills and consumer interests are familiar with and experienced in the use of the specifications listed.

Restrictions on structural steel have resulted in a sharp rise in concrete construction, and a consequent greater demand for reinforcement bars and spirals.

The schedule on railroad and transit service wheels and tires (Schedule 2) provides for establishment of standard sizes, effective in 60 days. The standards were developed by an Advisory Committee on Wrought Steel Wheels, composed of representatives of producer and consumer interests as well as representatives of the military services.

The standards have been accepted and issued in specification form by the Association of American Railroads, the American Society for Testing Materials and the American Transit Engineering Association.

The schedule reduces the permissible number of sizes for railroad service alone from 500 to 50. A similar reduction is made in the number of permitted sizes for electric-railway service. The standards, however, make provision for adequate replacements for all sizes in current domestic use. The period of 60 days until the schedule becomes effective is provided because of adjustments which must be made in modifying existing rolls and dies. No new equipment will be needed.

In addition to the usual advantages resulting from standardization, establishment of the railroad wheel and tire schedule is expected to expedite inspection procedures. Although production of railroad and electric-railway equipment has been curtailed, maintenance of rolling stock will require a continued substantial output of wheels and tires because of the increased loads being placed on transportation services.

Establishment of the order and schedules has been supervised by C. L. Warwick, chief of the Specifications Branch of the Conservation Division. The detail work involved in the project has been accomplished through technical advisory committees composed of technical representatives of producers and consumers. The committees set up for each product had available the experience and guidance of organizations such as the American Iron and Steel Institute, the American Society for Testing Materials, the Society of Automotive Engineers, and the Association of American Railroads.

Heat Therapy

THE GLENN L. MARTIN COMPANY

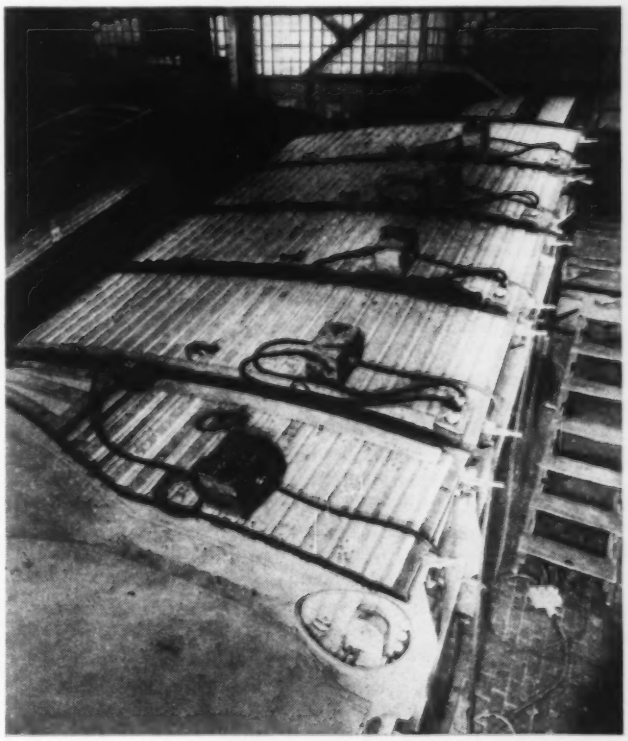
HEAT therapy has moved out of the hospitals and into the aircraft industry through a recent development at The Glenn L. Martin Company.

A major difficulty in the riveting of aluminum "skins" over spars and ribs to make wings has always been the unavoidable wrinkling and buckling of the skins under the pounding of riveting hammers. The wrinkling and buckling, even though slight, interfere with the smooth flow of air over and under the wing. This impairs the efficiency of the wing and thus of the whole plane.

The system of "heat therapy" devised by Harry F. Kniesche, assistant factory manager at the Glenn L. Martin plant, solves that difficulty by expanding then shrinking the skin on the wing. The new process also greatly simplifies and speeds the wing-covering operation.

The various sheets of aluminum that make up a skin are riveted together on a wood frame that has the shape of the wing. The skin, full now of unavoidable small buckles and wrinkles, is then laid on the wing of the ship. The skin heater, which might be described as an oversized version of the electric heating pad people apply to a sore back, is laid on top of the skin. The heater fits snugly, for it has the exact contour of the wing.

The heat is turned on. In a few minutes the skin has a tem-



AIRPLANE "SKIN HEATER" IN ACTION REMOVING WRINKLES AND BUCKLES FROM ALUMINUM SKINS OF BOMBER WINGS

perature of 140 F, which causes enough expansion to rid it of all wrinkles and buckles. While rheostats hold the temperature constant, the skin is quickly stitch-riveted round the edges and along the ribs. Then the heater is removed and the skin shrinks as taut and unwrinkled as a drumhead.

Gilding Metal-Clad Steel Scrap

WAR METALLURGY COMMITTEE, NRC

IN ORDER to save alloy, the Ordnance Department of the United States Army has decided to use a brass-clad steel for bullet jackets in place of the customary solid brass formerly used. The cladding will contain 90 per cent copper and 10 per cent zinc and will amount to approximately 20 per cent of the weight of the material, the remaining 80 per cent being mild steel.

In the production of the bullet jackets, considerable clad-steel scrap will be produced, and it is estimated that its production will amount to 20,000 tons monthly by May of 1943. Part of this scrap will be steel-mill scrap, part will be webbing, and a lesser amount will be from cup-forming operations. Superior Steel Company at Pittsburgh, Pa., is already in production of clad jackets and has already accumulated a large tonnage of reject pieces. Other companies are also starting to produce, and scrap is believed to be accumulating at the rate of about 1200 tons monthly. Companies now producing, or soon to be in production are: Superior Steel Company, Weirton Steel Company, Carnegie-Illinois Steel Company, American Steel and Wire Company, Sharon Steel Corporation, Allegheny Ludlum Steel Corporation, Acme Steel Company, Republic Steel Corporation, and McClouth Steel Company.

The rapid piling up of this scrap with no developed program for its recovery is of serious concern to those responsible for our copper and steel production. The War Metallurgy Committee of the National Academy of Sciences has been asked by K. D. Mann, assistant chief of the Product Branch of the War Department, and by H. O. King, chief of the Copper Branch of the War Production Board, to make a survey of this problem and to submit recommendations.

SUMMARY AND RECOMMENDATIONS

At the request of representatives of the War Production Board, several industrial concerns have considered recovery methods on the gilded steel scrap, and a variety of processes which showed promise have been tried.

One of the methods is a standard leaching procedure as applied to copper ores. This process, which is based on the solvent action of cupric ammonium carbonate on the metals copper and zinc, has been shown to be workable on this material. It is a cheap and efficient method which will allow for almost complete recovery of the copper and the iron in separate products, the copper in the form of the oxide and the iron as unattacked scrap. The recovery of zinc will depend on the subsequent operations performed on the mixed oxides.

The process has already been demonstrated on a pilot-plant scale, and the speed with which units can be put into commercial production will for the most part depend upon the availability of men and materials for the design and construction of the plant.

None of the other processes which were considered has been developed past an experimental stage, and none of them showed any worth-while advantages over the ammonium-carbonate leaching mthod.

There are three known companies who have had experience with the leaching of gilded steel by the cupric-ammonium-carbonate method. These companies are the Calumet and Hecla Consolidated Copper Company at Lake Linden, Mich., the American Metals Company at Carteret, N. J., and the Copperweld Steel Company at Glassport, Pa.

The Calumet and Hecla Copper Company have operated for many years a cupric-ammonium-carbonate leaching plant in the treatment of copper ores. They also have, for the past couple of years, commercially treated copper-clad steel. At the present time, at their Lake Linden plant in Michigan, they have capacity to treat 2500 tons per months of gilded steel and are ready and willing to accept this amount of material immediately. They have an additional capacity of 7500 tons monthly for the leaching of bimetal scrap, but oxidizing equipment for the treatment of the additional material would have to be built. Furthermore, they have existing smelter capacity to handle the entire tonnage of copper oxide which should result from the processing of 20,000 tons of gilded steel per month. However, no recovery of zinc would be made under the present operating conditions at the plant. A recovery plant, however, could be installed.

The Copperweld Steel Company has, for a number of years, been interested in and experimented with the recovery of the copper and iron from the scrap made in their own plant. They now have a pilot unit under construction for the treatment of some of their own clad material. The pilot unit has for its primary purpose the training of men in the operation of the ammonia process. They have retained Archer E. Wheeler, consulting metallurgical engineer, to draw up preliminary plant and operating-cost estimates on a commercial unit. These reports have been made available to the Committee.

The American Metals Company operated an ammonia leaching plant for a number of years in recovering zinc from their flue dust at Carteret. They, too, have men already experienced in the designing and operation of a plant.

These three companies mentioned are all considered qualified to construct and operate cupric-ammonium-carbonate leaching plants for the treatment of gilded steel scrap. Aside from the matter of transportation, Calumet and Hecla are probably in the best position to carry on the work by constructing additions to their present plant. From the standpoint of transportation, it appears that the Cleveland or Pittsburgh area is the best location for a plant if the construction of a single central unit is contemplated.

The contracting company or companies will need to consult with the scrap producers and determine the most suitable form which the scrap should have on delivery to the recovery plant. In addition to that made in the production of blanks for bullet jackets, about an equal amount of scrap is made at the fabrication plant. This also needs to be collected. The American Metals Company has suggested that the pieces be cut into approximately six-inch squares, and crimped to prevent packing together of flat surfaces. It appears that for the best over-all efficiency this should be done at the source of the scrap. In no case should the material be baled, and the present producing companies should be notified not to resort to this practice.

These companies will also need to have reliable figures on the total and relative amounts of different forms produced. Leaching tests on the scrap, properly proportioned as to types and shapes, can then be made to determine the tank capacity needed in the plant. Calumet and Hecla have made arrangements to get sufficient scrap to obtain the necessary data. With the desired tank capacity known and data available on the tonnage to be treated and the location of the recovery plant or plants, actual design and construction of units can be started

Estimates on materials needed and costs of construction and processing are given in the ensuing review of the survey.

In view of the fact that Calumet and Hecla now has available

capacity to treat 2500 tons of scrap per month, and since scrap is being produced only at the rate of 1200 tons per month, it is recommended that arrangements be made immediately with Calumet and Hecla to treat up to 2500 tons per month. The possibility of increasing the capacity at Calumet and Hecla also should be looked into carefully, because they have the smelting capacity to make high-grade copper bullion. As the maximum production may be reached early in 1943, it is recommended that the War Production Board make a careful survey of freight rates, construction costs, etc. to determine where additional capacity can be located. This should be done immediately. So far as possible, the copper and zinc oxides should be treated for metal recovery in existing plants.

Langley's "Aerodrome"

SMITHSONIAN INSTITUTION

THE unfortunate controversy which developed over the Langley Aerodrome and the Wright brothers Kitty Hawk plane and which resulted in the sending of the Wright plane to England appears to have been brought to an amicable close by the publication, October 24, 1942, in a form acceptable to Dr. Orville Wright, of a paper "The 1914 Tests of the Langley Aerodrome," by C. G. Abbot, secretary, Smithsonian Institution. Dr. Abbott makes generous apology for the Smithsonian's part in the controversy. "If publication of this paper should clear the way for Dr. Wright to bring back to America the Kitty Hawk machine to which all the world awards first place, it will be a source of profound and enduring gratification to his countrymen everywhere. Should he decide to deposit the plane in the United States National Museum, it would be given the highest place of honor, which is its due."

A considerable portion of Dr. Abbott's brief paper is a list of differences between the Langley plane as tested in 1914 by Glenn H. Curtiss at Hammondsport, N. Y., and as it existed in 1903.

Tin-Free Gear Bronze

THE HAMILTON GEAR AND MACHINE COMPANY

A COMMUNICATION from Chester B. Hamilton, Jr., member A.S.M.E., of the Hamilton Gear and Machine Company, Toronto, Canada, calls attention to a report presented to the American Society for Metals at Cleveland, Ohio, Oct. 16, 1942, in which he announced that his company had found a tin-free gear bronze "which is not merely a substitute material but actually superior for this purpose to the conventional metal."

As a result of researches made by his company in 1931–1934 on all phases of worm and gear design, including materials, they had settled on a copper-tin-nickel bronze ($87\frac{1}{2}$–11–$1\frac{1}{2}$), which resembles S.A.E. No. 65 with the addition of nickel, as the best. However, with the loss of tin supplies as a result of the war, a substitute material had to be found. All known copper alloys, except beryllium copper, which was not available, were tried, and special attention was given to several trade-marked bronzes known to be good for other purposes than gears, following which all constructions of all commercially available alloying were investigated. The object was to find a metal which, used as a worm gear, would have high load-bearing ability, including both strength and resistance to wear, and would operate with a moderate temperature rise. All tests were of worm gears mated with hardened and ground worms, rigidly aligned in enclosed speed reducers with bath lubrication. The output power and the bath temperature were measured.

As a result of these tests a copper-nickel-antimony combination was found that was better for the purpose than peacetime bronze. To determine the best proportions of the mixture it was assumed from previous experience that the nickel content should be about 2 per cent. After trying several antimony combinations, it was found that best results lay between 7 and 8 per cent antimony. With the antimony determined, the percentage of nickel was varied. Best results lay between $1\frac{1}{2}$ and $2\frac{1}{2}$ per cent.

With the former copper-tin-nickel bronze it had been the practice to cast the gears in a chill ring, Mr. Hamilton reports. Hence the copper-antimony-nickel test gears were made in duplicate, and sand-cast and chilled. At present it appears that chilling does not improve the metal. No cases of pitting or spalling of the metal have been found. Roughly speaking, says Mr. Hamilton, worm gears of this metal will carry about 25 per cent more load than tin bronze or will run about 15 F cooler at the same load. Physical properties of metal of mean composition were given as a yield point (limit of proportionality), 19,000 psi; ultimate, 31,900 psi; elongation in 2 in., $7\frac{1}{2}$ per cent; and reduction in area, 15 per cent.

Mr. Hamilton acknowledged the co-operation of O. W. Ellis, of Ontario Research Foundation, and the Canada Metal Co., of Toronto. Patents are not being applied for, he stated, nor were restrictions being imposed, as the new metal is a free gift to the United Nations.

Alloy-Steel Situation

WAR PRODUCTION BOARD

WITH essential requirements for alloy steels during 1942 estimated at more than double the 1940 consumption, the War Production Board is engaged currently in a broad-scale program to assure an adequate supply of these metals, essential in every phase of our military program.

Among the major steps undertaken by W.P.B. to fit the essential requirements to the supply has been the development of National Emergency alloy steels. Seventeen steel producers have been permitted to ship experimental amounts of emergency steels to laboratories or manufacturers in the fourth quarter.

W.P.B. has moved in other ways to solve the alloy-steel problem. In conjunction with the industry and with technical groups, W.P.B. has speeded the combination and substitution of the more plentiful alloying elements for the scarcer ones.

Progress also has been made in expansion of production and imports. Next year, for instance, chromium production in the United States will be nearly 250 times as large as the output in 1940. In 1941, our supply of nickel was 11 per cent less than it will be this year. Last year we had 27 per cent less molybdenum than we will have this year. But still there will not be enough to meet nonessential demands.

Having adequate amounts of alloy steels is of course a prime military necessity. The alloying of steel, therefore, is among the major techniques of the metallurgy of war. Six important alloying metals, properly combined with steel, are used in the production of the highly specialized and "tailored" steels needed for various tasks.

The problem of alloy-steel supply is complicated by the fact that of the six alloying metals—nickel, chromium, manganese, tungsten, vanadium, and molybdenum—all but one come principally from outside the United States. In peacetime, the first three were almost wholly imported.

But despite the fact that the war has cut so sharply into our

supplies of these metals, essential requirements for alloy steels have shot up 240 per cent since 1940.

Permission to ship amounts of the emergency steels will allow for thorough testing of the new alloys in which greatly reduced quantities of critically scarce alloying metals are used. The new series of steels features compositions having suitable amounts of manganese and silicon in combination with the scarce metals to produce steels with mechanical properties similar to the more highly alloyed types.

Such shipments may be made, in limited amounts, without regard to preference ratings. It was pointed out that, although the permission extends only to specified companies, any producer who desires to ship the new steels for testing purposes may do so after application is made to the Iron and Steel Branch.

Because of the widespread substitution of one metal for another, the six metals should be considered as a group. All of them are scarce, and the requirements of our present munitions program for each are greater than the supply of each. But the shortage of no one alloy metal will be permitted to shut down production. By substitutions, new alloys are being developed and maximum use is being made of alloy scrap.

The United States program for alloy steels is co-ordinated with the program of the British Ministry of Supply through the Combined Raw Materials Board. Following is a summary of the general situation in each of the six alloying steels.

CHROMIUM

In 1936, we used 323,258 tons of chromite ore, all but 269 of which were imported from Africa, Cuba, the Philippines, and Turkey. This gives a fair picture of what we were up against when foreign supplies were threatened. By 1940, when war had broken out in numerous spots on the earth, consumption doubled over 1936, and imports increased ten times. But domestic production was still only 2666 out of 657,689 tons total supply.

To meet military and essential civilian requirements in 1943, we will need about three times the tonnage of 1939. This includes cutting civilian needs to about three per cent of the total.

Large low-grade deposits of chromite ore have been developed in Montana, California, and Oregon. These ores are not of high quality, but are adequate in an emergency. The Reconstruction Finance Corporation is providing over $10,000,000 for chromium projects, and private industry is adding several million more. The net result will be a domestic output in 1943 as large as imports in prewar years.

Despite increased domestic production, the situation remains critical. War needs will require more chromium this year than we used for all purposes in an average peacetime year. Next year, requirements will again be heavily increased.

MOLYBDENUM

Molybdenum used to be a refreshing spot in the welter of materials shortages that followed on the heels of all-out war production, since we produce well over 85 per cent of the world's supply.

Molybdenum imparts some characteristics to alloy steels that no other metal does, although in many cases, other alloying metals are interchangeable. In the early stages of war production, molybdenum was widely substituted for tungsten, chromium, nickel, and other more scarce alloys. As is the case with any juggling of supply, a state of balance arrives very quickly, and the formerly plentiful metal becomes just as short as the ones for which it was being substituted.

Normal domestic production was about twice the domestic demand, thus a large part of the production was exported. With the coming of the war and a curtailment of exports, there was an excess of production, which was carefully stockpiled.

Domestic supply will increase some 15 per cent in the year 1943 and in addition, new explorations are being carried out on old and new properties once thought too unproductive to work. If tests are favorable, some several million additional pounds will become available.

TUNGSTEN

If the supply of tungsten (needed for cemented carbides as well as tool steel) is not sufficient for war needs, it is not because domestic production has been slipping. In 1939 we produced just over 3600 tons of tungsten concentrates. By 1941 this had doubled, and this year will be doubled again. Imports spurted likewise. In 1939, we imported some 800 tons of the metal, in 1940, over 2800 tons.

Large imports, in 1940 and 1941, helped to build a stockpile for us, but with spread of the war to the Far East Oriental supplies were cut off. Imports from this source for 1942 will be much less than in 1941. Production in Latin-American countries is being stimulated, and for the duration of the war at least, Argentina, Bolivia, Chile, Peru, and Mexico will be our principal foreign sources of supply.

In the face of reduced imports from the Far East, strenuous efforts are being made by the U. S. Geological Survey, WPB, Bureau of Mines, Metals Reserve Company, and domestic producers, to locate and develop United States tungsten properties. A California deposit has been developed which will yield 17 per cent of the new tungsten this year. Another plant has been erected in Nevada which is producing almost as much.

The biggest United States development was the discovery by the Geological Survey of tungsten in the antimony-gold ores being mined in Idaho. This one property alone is currently producing 27 per cent of our tungsten.

In addition to the substitution of lower-tungsten steels wherever possible, W.P.B. has ordered (through Conservation Order M-14) that 75 per cent of molybdenum-type alloys must be used to fill high-speed tool-steel orders, only 25 per cent of a purchaser's orders being allowed to take tungsten alloys.

One example of the many efforts to develop tool steels to conserve tungsten is a new alloy using 1 to 1.5 per cent tungsten and 9.5 per cent molybdenum, instead of the previous combination of 18 per cent tungsten, 4 per cent chromium, and 1 per cent vanadium. The whole tungsten story adds up to a net shortage this year of somewhat over 10 per cent. Imports for 1943 cannot be predicted with accuracy.

The hope of averting a shortage of tungsten lies in substitution of other metals in alloys, collection and proper use of tungsten-bearing alloy scrap, further domestic development, and maximum importation of all available foreign ores and metal.

VANADIUM

Vanadium is produced in these countries, in this order of importance: Peru, United States, Southwest Africa, Northern Rhodesia, Mexico. United States production has doubled since 1937, will be highest in history in 1942. Imports into the United States in 1942 are down somewhat from 1940.

One large domestic producer is working with Metals Reserve Company on arrangements which will permit the mining of very low-grade marginal ore which will yield an additional 2,200,000 lb of vanadium. Government financial aid is being given mines whose ore is so low-grade that it cannot be extracted at present prices.

W.P.B officials do not expect a vanadium shortage, as such. We certainly need more than we have, but available supply is being dumped into the alloy hopper, where any shortage will be of all metals, and not of vanadium alone.

In 1943, further increased production, recovery of metal from flue ash, and miscellaneous small sources are expected to double 1942 available supply. Exact requirements for 1943 are not

known, but if anticipated production is forthcoming, the shortage may become less critical than is feared at the present time.

NICKEL

Nickel is one of the oldest steel alloys, being found in the sword blades of ancient warriors. Exactly the same need for hardness, toughness, and corrosion resistance that made nickel useful to the ancients makes nickel essential for steel for armor plate, projectiles, tool steel, engine parts, and guns.

Besides alloying steel, nickel is needed urgently for cupro nickel for condenser tubes, for heat-resisting alloys for heat-treating furnaces, for corrosion-resistant process units in chemical industries, and as a catalytic agent in production of synthetic rubber and high-octane gasoline.

We do produce some nickel in this country, but only negligible amounts—two to three thousand tons of secondary metal recovered from scrap, and 500 tons or so of primary metal as a by-product of electrolytic refining of copper. Contrast this with Canadian production in 1939 of 102,000 long tons. New Caledonia produces about 10,000 tons, and Russia about 2500.

War needs for 1942 and 1943 are skyrocketing, and even with curtailment of unessential uses, maximum recovery of scrap, and highest possible production, serious shortages loom. Essential 1942 demand will run some four times that of 1938, and will jump to five times in 1943.

The principal means of overcoming the acute shortage lie in development of new sources, substitution for and combination with other metals, and more effective utilization of scrap. Explorations are being carried on in the United States by the Geological Survey and the Bureau of Mines, but so far have not uncovered any worth-while deposits. Mining development loans have been made to further the development of two projects—one in Colorado and one in Washington. But production from these mines is not expected to be large.

The most significant possibility of expanding our supply is increasing nickel imports from Cuba. A subsidiary of a United States corporation has secured $20,000,000 aid from the Reconstruction Finance Corporation to treat Cuba ores by a special process developed for the treating of low-grade manganese ores. Concentration of nickel in Cuban ore is low; it is expensive and difficult to extract; but our need for nickel is so great that even comparatively sparse sources are being called upon.

The largest producer of nickel in the world is spending several hundred million dollars of its own money to expand its Canadian mine, mill, smelter, and refinery. A smaller Canadian producer is also expanding its facilities at its own expense.

Scientific Production

SCIENCE

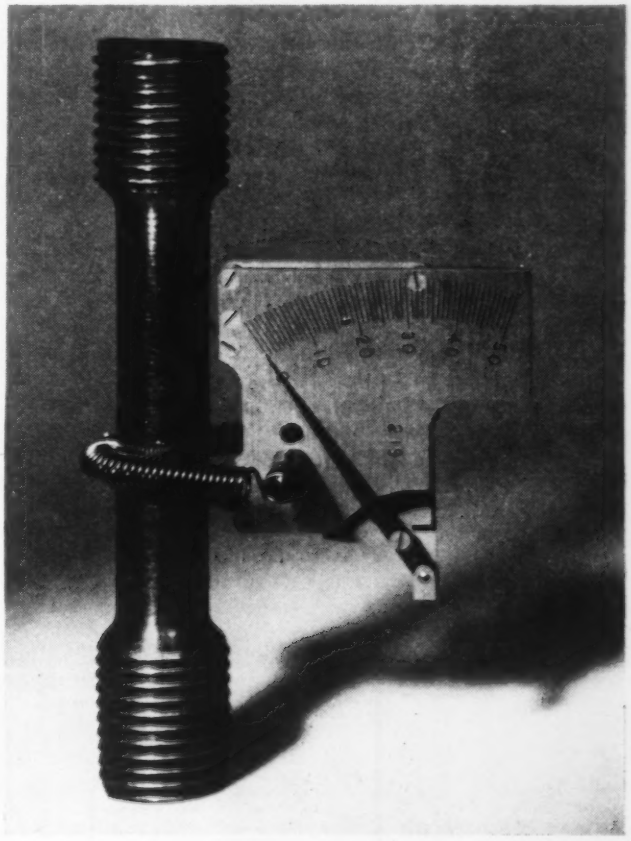
IN THE war emergency, academic production has suffered in contrast with the industrial, according to J. S. Nicholas, of Yale University, in *Science*, Oct. 30, 1942, in an article, "Wartime Maintenance of Scientific Production."

The fact that we are participating in total war which demands total effort cannot be overemphasized. The total effort of academic groups has so far been harnessed in only a desultory fashion. Research men have been called into the services or into govenmental organizations without thought for the future. No replacements exist in some fields for the men who have been withdrawn to necessary and urgent work, either in industry, governmental research, or armed services.

No advanced planning could have foreseen the extent of our academic involvement but now the time has come when the allocation of certain groups of personnel must be accomplished as ruthlessly as is the work of the local tire-rationing boards. This is peculiarly so in highly specialized and trained groups in which we have a sharply limited supply. Some of these supplies have reached a level so low that replacement production is seriously impeded. In the academic field we have been muddling through so far by changing the working load, by accelerating schedules and eliminating vacation time. This would considerably increase output if we retained an adequate staff on the academic production line, but this it has been impossible

The fields from which the greatest amount of research personnel has been removed for war effort are those which now have the greatest teaching load in production. Specifically, the shortages are greatest in physics and mathematics, which are focal points of emphasis in the new armed forces' program now rapidly becoming installed in our colleges and universities. The enrollments in these fields, particularly during the immediate future, will be far greater than even a full peacetime staff could handle, for many students in upper classes will, by the service regulation, be compelled to complete this training. Depletion of the staff by the part-time or full-time participation in other war activities must be recognized as a fact We must produce substitutes in these fields just as energetically as we would produce a rubber substitute.

For the past eight months we have been robbing Peter to pay Paul in the academic world. Bidding for available men in a field has proceeded with alacrity as one institution has taken



AMERICAN-BUILT STRAIN GAGE

(This mechanical type of gage is said to be accurate, light, compact, rugged, and convenient, yet inexpensive. The strain multiplication factor is approximately 300 and it has a range of 0.008 in. or better. Weighing only 0.4 oz the gage has over-all dimensions of $1\frac{3}{4}$ in. × 2 in., × $\frac{5}{8}$ in. It is graduated so that each division corresponds to a strain of approximately 0.0001 in. and has a readable accuracy of 0.00002 in. for a gage length of one inch.)

men from another in order to satisfy its needs. The original supplies have been exhausted, but there is a new source to be tapped; the problem now appears possible of solution, at least in part, by the appropriate transfer and utilization of trained men from other fields. Geologists and economists can take over the teaching load in physics, chemistry or mathematics. Biologists and psychologists can take over other teaching duties in addition to those incident to their own important output which must be maintained. It is possible that some teachers in history, classics, linguistics, anthropology, and literature may also be fitted to teach in mathematics, particularly at elementary levels. The personnel of our schools and departments of education should be particularly applicable to such needs.

A teacher is a teacher, irrespective of the branch of learning. The methods and the students are the same—only the subject matter is different. The university and college grade teacher can and must carry his personality and intellectual acumen into other fields of endeavor in addition to his own. This, while it may not be easy, is an immediate necessity. The standards and detail of subject matter must be clearly presented to the substitute volunteers, and possibly refresher courses must be given by the specialists still remaining on the staff. This is one obvious source of man power which can be utilized in the production of scientifically trained men.

A second source may be drawn upon from individuals who are in administration and have been removed from student problems for a long period of time. Many institutions are carrying a too large proportion of administrative officers, some of whom could be usefully reallocated at teaching.

There is a third source as yet practically undeveloped and that is in the field of woman power in academic teaching. For many years women have been discouraged from attempting to enter academic fields. Now we need all of them that have been adequately trained and unfortunately that number is exceedingly limited, for when their placement has been made difficult for many years and their acceptance even by our leading female colleges has been tardy, all too few first-rate women scientists have been trained. Today we could use ten times the number available if only peacetime prejudices could be overcome.

From the foregoing it is clear that there are many phases to the battle of scientific personnel production. One phase cannot be overemphasized sufficiently, and rests with the personal conscience of many a teacher of science. It is easy to leave ones' post and to accept new responsibilities, but are they always of greater utility than the accustomed routine or its possibility of rejuvenated potentiality? The importance of what you are now doing and how to intensify your effort must be evaluated by you individually. The home front is a pressing one which demands the best that we have if we are to keep our training program intact. We cannot proceed on the simple substitute principle. A greater and more far-reaching view is demanded with a look toward a war future which is longer than any of us had ever anticipated. With this in mind let no one belittle his talents and opportunities on the home front of academic production. They are important, vital, and of a degree of necessity which the country now demands. We will win the war—we must have trained thinking men to win and maintain the peace

Reinvestment of Corporate Earnings

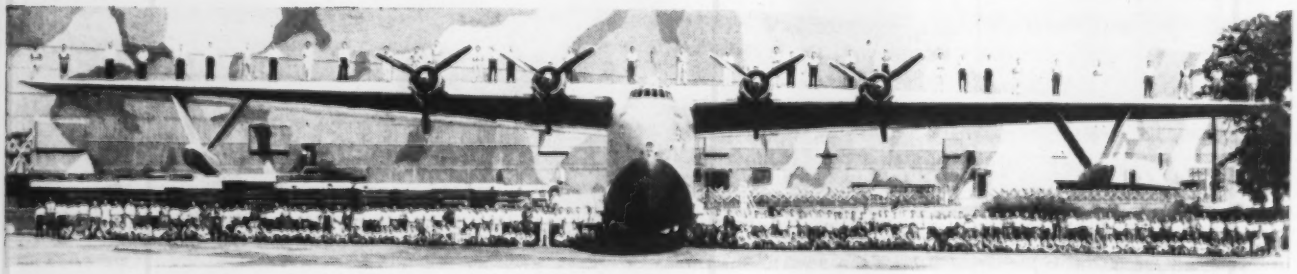
(*Continued from page 900*)

theory of dividend policy has been used here in order to indicate one aspect of recent progress in financial science and to provide a springboard for welcoming new revisions of two standard works. The war problem was mentioned primarily in order to supply a necessary qualification of the new dividend recommendations which, if summarized without reference to war conditions, might well be misleading.

Three reasons exist commonly for presenting new editions. The illustrations may be brought up to date, the method of exposition may be improved, and new material may be added. Both of the works to be mentioned have added some new illustrations; but in both instances the modernization of their illustrations is of negligible importance when compared with other features.

Dewing's works have always been characterized by great intellectual power; but in some previous editions his exposition has been careless. Such defects are remedied in this new edition. In substance also the book is improved. The chapters dealing with bankruptcy and reorganization are emended notably. New statutes and new judicial decisions are inserted in the proper context so that the whole development is more orderly. No other portion of the book is perhaps altered so greatly; but at many points the master's hand can be seen rejecting, cutting, and improving.

Graham and Dodd approach their problem as investors rather than as corporation executives. Their recent edition[6] differs from their previous stimulating volume in many details. New topics have been included; but for many readers the most important change is "the addition of clarifying material at many points." In each decade the study of finance becomes less purely descriptive and more truly scientific. In the investment portion of this field it is exceptionally easy to lapse into mere description; but Graham and Dodd contribute to investment finance a scientific approach that cannot fail to be helpful to many investors. Even though it has been the general policy of this column to review only new books and to restrict the mention of new editions to brief compass, these two substantial revisions of standard works seem to be sufficiently important to warrant at least one exception to a general policy.



MISTRESS OF THE AIR—AND SOME OF THOSE WHO BUILT HER

(The mighty Martin *Mars*, 70-ton Navy flying boat and the biggest ship of her type in the world, forms a background for part of the experimental crew that built her. Thirty-five men, spaced about six feet apart, stand along her 200-foot wing and 215 other persons are grouped before the ship. Announcement of the Mars' conversion into the world's largest air cargo carrier was made recently by Glenn L. Martin, President of The Glenn L. Martin Company and pioneer developer of huge flying boats.)

COMMENTS ON PAPERS

Including Letters From Readers on Miscellaneous Subjects

"The World We Want"

To the Editor:

IN Lieutenant Ramon Wyer's article,[1] "The World We Want," it is asserted that the series of restrictive laws, enacted to protect fairness in business and to stamp out ruthlessness, imposed artificial restrictions on commerce, prevented natural economic forces from providing the readjustments in our business structure which had been more or less automatic previously, finally culminating in the Great Depression.

Many of us will disagree with Lieutenant Wyer's opinion that these restrictive laws had much, if anything, to do with the depression. To this writer, the base cause of the depression was that for the larger part of the postwar decade our industrial production, especially in so-called luxury lines, had risen far beyond the purchasing power of our people to absorb it. That is to say, that part of our production which was distributed in the form of salaries, wages, dividends, etc., was inadequate to keep our industrial machine operating at full or near-full capacity.

For a number of years everything seemed to be going well in this "two-chickens-in-every-pot" and "two-cars-in-every-garage" era, few of us giving any thought to the dangerous fact that a large part of the buying was being financed on borrowed money or past savings. But when 1929 rolled 'round the average individual found himself with savings badly depleted and with a debt on his hands that was fast becoming unsupportable. Retrenchment was the only choice and this caused such a curtailment in buying that our industries could no longer function adequately. Soon, many of these industries had to run on short time; greater and greater unemployment followed and then, quite naturally, the depression. It was the only and logical sequence of unsound economics.

How heavy had been the drain upon mass savings in an attempt to support the new standards of living is evidenced by the fact that within a few short months following the stock-market debacle in 1929, the bread lines were assembling in our large cities. During this period of buying hysteria, our people, collectively, were doing precisely what our government did throughout the depression—spending money far in excess of current income.

There were, of course, other contributory causes to the depression, notable among which were the stock market and high finance jugglery, maldistribution of national income, and prohibitive tariffs, but none of these nor all of them together could have produced the catastrophic collapse we experienced if the consuming public had been able to finance its purchases out of current income.

If, after the war, our system of free enterprise is to survive—if we are to avoid the disaster of socialization—some way must be devised to place in the hands of our people, buying power adequate for them to purchase enough products and goods to keep the farm, mill, mine, and factory operating at full capacity. This cannot be accomplished simply by increasing wages, but, rather, by increasing the buying power of the dollar. New methods of production, new and better metals—advancement and improvement in every line brought about by the necessities of the war—should make it possible to provide every industrial product our people need at prices so low that a national income of $70 billion annually would have greater purchasing power than our peak income in predepression days. And one of the *musts*, if our system of free enterprise is to endure, is that the output of no product must be deliberately and intentionally restricted in order to maintain prices and profits at high levels.

In conclusion, permit me to say that it is my opinion that we need have no fear of socialization, if we intelligently plan and build for the long hard pull ahead—planning which must include the forbiddance of any schemes for the acquisition of easy quick wealth.

W. C. Peck.[2]

[1] Mechanical Engineering, October, 1942, pp. 727–730.

[2] Pennsylvania Pump and Compressor Company, Easton, Pa.

"Censorship"

To the Editor:

Relative to the statement made by Mr. Gregory M. Dexter in the October, 1942, issue of Mechanical Engineering, page 757, as to supporting evidence with respect to censorship of professional papers by the Society:

I am not opposed to censorship or checking of professional papers. Checking for accuracy is a practice that is fundamental and common to engineering. I am, and have always been, in favor of "censoring" or checking the accuracy of technical information and for clearness of presentation. As stated in my letter to the editor, which appeared in the March, 1942, issue of Mechanical Engineering, page 232, I well appreciate the difficulty the Society has in handling this committee work, and the amount of hard work that members of the Society and division program committees have to do to make papers clear and presentable. "Censorship" is a necessary evil of Society operating procedure.

However, the problem of "censoring" papers on economic and professional subjects, most of which appear to be sponsored by the Management Division or by the Committee on Education and Training for the Industries, has never, in my opinion, been satisfactorily handled by the Society. This also includes many of the reports published by the Engineers' Council for Professional Development. I also strive to be optimistic. Somehow or other, the so-called economic papers seem to get tangled with questions of Society policy—which policy as applied to management and to economics, I have never read or heard stated. If the Society has an "economic policy," other than the handling of its own fiscal affairs, it is a secret to most of the members.

From the standpoint of ethics, I do not think that we should sponsor a paper panning, by inference or otherwise, the management or operating practices of an individual company or corporation.

The only ones competent to defend the concern being hauled over the coals are the officers of the defending corporation. About all the rest of us can do is to attend the meeting and watch the fight if there is one. It is certainly the business of the several program committees to see that no concern is placed in that kind of an embarrassing position.

As to papers on economic subjects: I had an experience somewhat similar to that into which Mr. Dexter is trying to project himself and from which the program committee is apparently trying to save him. I stuck out my chin at the December, 1934, meeting when I presented a paper entitled, "An Analysis of Occupations of College Grade." The paper did, unintentionally, offend the sensibilities of many of the older members, especially those engaged in educational work. It was not what they wanted, or had hoped, to hear. The fact that the comparative occupational gradings and forecasts contained therein have since proved to be correct, as have been shown by subsequent events to date, makes little material difference. The presentation of such a study at that time was inopportune. The timeliness of a paper is certainly something for a program committee to decide.

The difficulty with papers on nontechnical matters is that no one is sufficiently familiar with the subject to provide intelligent discussion. In my own case, I had developed an analysis made by a former business associate into an occupational research, a subject in which I was interested because I was out of a job at that time. It was a highly specialized subject about which other members of the Society knew little or nothing, but about which they had definite convictions. My paper would have been received with much better grace, and would have served a more useful purpose, if it had been presented before the S.U.E. (Society of Unemployed Engineers).

Our programs have been cluttered up with papers on subjects that should be sponsored by societies other than The American Society of Mechanical Engineers. This also is a censorship job of our program committees. It involves to a considerable extent the development of relations with other societies and associations to see that nontechnical papers are provided an outlet and the right kind of an audience. We have gone part way in this by arranging joint meetings.

As I see the situation, the thinking of the Society has been going through the same cycle of thought and action that the nation went through prior to December 7, 1941. Some of us knew what was going on in Germany during the late 1930's, and had the facts to prove it. Some of us knew of the bund and similar activities being organized in this country during that time. However, there were recent years during which it was unsafe to tell what you knew without being classified as crazy, a militarist, or something else at that time uncomplimentary or unpopular. It was a period of environment and selfish interest during which none of us were in the frame of mind to face grim and unpleasant realities. In this I do not think that the Society or any individual can be severely criticized. Few of us are able to live above our environment.

Just what the war will do to our thinking processes and to our willingness to face unpleasant realities is a matter of conjecture. There is no doubt but that it will exercise a profound influence on the work of our program committees. After all, the general trend of thought action will directly influence our thinking and attitude to developments in our profession. It will not do any good to be impatient. In this, patience will secure its own reward. In the meantime, we can strive diligently for those things we hope to see in an enlightened and courageous society of engineers, and at the same time not overlook the saving grace of a good sense of humor.

MARION B. RICHARDSON.[3]

[3] Mem. A.S.M.E.

Patent Legislation

TO THE EDITOR:

Lately there has arisen a new crop of crusaders who consciously or unconsciously attempt to wreck the American patent system, which in the past has so largely contributed to our material progress. The President of the United States has wisely appointed a Patent Planning Commission of eminent men, charged with the duty of making a survey of the entire patent situation and recommendations for the improvement of our patent system. But the crusaders are not willing to wait for the report with their reforms, and have introduced in Congress a flock of bills, most of which would completely emasculate the patent system and wipe out any benefits to be derived therefrom by the public.

Engineers have a vital interest in the patent system and yet the majority are woefully ignorant of the contents of the proposed bills and many have never troubled to apply engineering thinking to the garbled statements and to reports regarding the functioning of the patent system which appeared in the newspapers.

Appended to this letter is a bibliography of some recent writings on the patent system. The reading of these articles should be profitable to every engineer.

The Engineers' Society of Milwaukee and Affiliated Societies have felt that some positive action should be taken to arouse the interest of the engineers, and a special meeting of all technical men was held on October 1, at which Wm. F. Buckley, a Milwaukee patent attorney, spoke on the "Constitutional Right for Protection to Inventions," and W. E. Crawford, a fellow of the A.I.E.E., spoke on the "Future of Inventions in Relation to Science and Engineering in Itself."

As a result of the papers and ensuing discussion, a resolution was passed opposing any patent legislation until the report of the Patent Planning Commission is available.

It is the writer's belief that it would be profitable for other Engineering groups to hold similar meetings, and the National Engineering Societies could well afford to arrange for discussion of the subject at one of their national meetings. The engineer, as a professional man, owes it to the public to be informed in such matters and to help in guiding the attention of the public toward an unbiased appraisal of the role which patents and inventions play in our social and economic structure.

ARTHUR SIMON.[4]

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[4] Patent Attorney and Engineering Consultant, Milwaukee, Wis. Mem. A.S.M.E.

A.S.M.E. BOILER CODE

Interpretations

THE Boiler Code Committee meets monthly for the purpose of considering communications relative to the Boiler Code. Anyone desiring information on the application of the Code is requested to communicate with the Committee Secretary, 29 West 39th St., New York, N. Y.

The procedure of the Committee in handling the cases is as follows: All inquiries must be in written form before they are accepted for consideration. Copies are then sent by the Secretary of the Committee to all of the members of the Committee. The interpretation, in the form of a reply, is then prepared by the Committee and is passed upon at a regular meeting of the Committee.

This interpretation is later submitted to the Council of The American Society of Mechanical Engineers for approval after which it is issued to the inquirer and also published in MECHANICAL ENGINEERING.

Following is a record of the interpretations of this Committee formulated at a meeting held on September 11, 1942, and subsequently approved by the Council of The American Society of Mechanical Engineers.

ANNULLED CASES

CASE No.	PARAGRAPH REVISED
753	U-76(d)
841	U-69, U-70
842	UA-18 to UA-24
874	Spec. S-34
880	Tables P-6, U-3
883, 900	U-42
909	Table U-3, Spec. S-59
920	P-251
932	P-281(a)
933	U-39(a)
936	P-112(d)
937	P-250, P-251
938	Spec. S-17
939	Preambles
946	H-61, H-114
952	Section IX
954	U-13(b)
956	Spec. S-36
965	P-103(a), U-71(a)
967	P-21(b)

CASE No. 830 (Reopened)

Revised items (3) and (4) of inquiry

(3) The welding procedure and welding operators are qualified under the rules of Section IX for fillet welding;

(4) The welding is stress-relieved, omitting radiographing.

CASE No. 968 (Reopened)

(Special Ruling)

Note: Since it was originally issued, the changes enumerated below have been made in this Case. The completely reworded Case follows.

(1) The 750 F temperature limitation has been deleted.

(2) Reference is made to Par. P-198, permitting increased design stresses for flat heads.

(3) Rule for determining maximum size of unreinforced opening has been added.

(4) Restriction on dished heads convex to pressure has been added.

(5) Restriction on ellipsoidal heads with flanged-in manholes has been added.

Inquiry: Due to the present need for conserving critical materials and the improvements in design, construction, and materials, may the design stresses for power-boiler pressure parts and the joint efficiency in fusion-welded construction be increased over present Code requirements?

Reply: It is the opinion of the Committee that drums and headers of power boilers may be constructed with maximum design stresses given in Table P-7 multiplied by 1.25, and a welded joint efficiency of 95 per cent may be used in the formulas in Pars. P-180, P-195, P-198, and P-268 with the following restrictions:

(1) The calculated thickness, using the 25 per cent increased design stresses, includes an allowance for stress concentration and thinning of sections by corrosion or other causes to a limited extent. After calculating the required thickness of shells and heads for boiler drums, using the increased design stresses permitted by this Case, an additive thickness of 0.1 in. shall be included for thicknesses of 0.4 in. and over. Below a thickness of 0.4 in., the additive thickness shall be one quarter of the calculated thickness.

(2) Excessive stress concentration due to sharp re-entrant angles or abrupt changes in section shall be minimized in design.

(3) Stresses due to hydrostatic head alone and other stresses which appreciably increase the average stress over substantial sections of shell or head above the allowable design stress shall also be considered in determining the thicknesses used in construction.

(4) Large temperature differentials in heads or shells shall be avoided or the effect reduced by shields or other suitable means.

(5) These increased design stresses may be used only for flat heads and for hemispherical or ellipsoidal heads with pressure on the concave side.

(6) The following shall be designed in accordance with the present rules in the Code and may be used with shells which are constructed in accordance with the rules of this Case:

(a) Dished heads, other than hemispherical or ellipsoidal;

(b) All unstayed dished heads with pressure on the convex side;

(c) Ellipsoidal heads with flanged-in manholes;

(d) All stays, braces, and parts requiring staying.

(7) Openings in the shell requiring reinforcement under Par. P-268 shall have the reinforcement applied uniformly on the inside and outside of the shell. If not so applied, the amount of reinforcement shall be calculated for a required shell thickness using design stresses from Table P-7. Openings in the heads may have reinforcement on the outside only.

In determining the maximum size of an unreinforced opening under Par. P-268(a), the value of K to be used in connection with the chart in Fig. P-53 shall be 1.1 times the value of K computed by the formula of that paragraph for that part of the shell that contains the opening. Where K, so computed, is unity or greater, the maximum size of an unreinforced opening shall be 2 in.

The maximum allowable working pressure for tubes for water-tube boilers as given in Table P-2, and by the formulas with Table P-2, may be increased by multiplying the values by 1.25, except that for tubes complying with Specifications S-17, S-32 Grades A and B, and S-40 only, 30 lb per sq in. shall be deducted from the pressure so determined.

Boilers constructed in accordance with the requirements of this Case and other applicable Code rules are considered safe and shall be stamped in accordance with Par. P-332, the Code symbol stamp to be followed by the letters "NE," which also shall be shown on the manufacturers' data report.

This Case shall be effective until it is annulled, revised, or Code revisions made.

CASE No. 979 (Reopened)

(Special Ruling)

Note: Since it was originally issued, the changes enumerated below have been made in this Case. The completely reworded Case follows.

(1) Reference is made to Par. U-39, permitting increased design stresses for flat heads.

(2) Restriction on heads convex to pressure has been added.

(3) Rule for determining the maximum size of an unreinforced opening has been added.

(4) Chrome-nickel steels covered by Case No. 897 allowed increased design stresses.

Inquiry: Due to the present need for conserving critical materials and the improvements in design, construction, and materials, may the design stresses and joint efficiencies for Pars. U-68 and U-69 vessels be increased over present Code requirements?

Reply: It is the opinion of the Committee that Pars. U-68 and U-69 vessels may be constructed with maximum design stresses given in Table U-2 multiplied by 1.25, and a joint efficiency of 95 per cent for Par. U-68 vessels and 85 per cent for Par. U-69 vessels may be used in the formulas in Pars. U-20 (*a*) and (*b*), U-36, U-39, and U-59 with the following restrictions:

(*1*) The ellipsoidal and hemispherical heads and the shells of air, steam, and water vessels, calculated by the rules of this Case, shall be provided with an additive thickness of one sixth of the calculated thickness, but which need not exceed $^1/_{16}$ in., in order to allow for corrosion. Vessels in other corrosive services shall be provided with appropriate corrosion allowances.

(*2*) Excessive stress concentration due to sharp re-entrant angles or abrupt changes in section shall be minimized in design.

(*3*) Stresses due to hydrostatic head alone, and other stresses which appreciably increase the average stress over substantial sections of shell or head above the allowable design stress, shall also be considered in determining the thicknesses used in construction.

(*4*) Large temperature differentials in heads or shells shall be avoided or the effect reduced by shields or other suitable means.

(*5*) These increased design stresses may be used only for flat heads and for hemispherical or ellipsoidal heads with pressure on the concave side.

(*6*) The following shall be designed in accordance with the present rules in the Code and may be used with shells which are constructed in accordance with the rules of this Case:

(*a*) Dished heads, other than hemispherical or ellipsoidal;

(*b*) All unstayed dished heads with pressure on the convex side;

(*c*) Ellipsoidal heads with flanged-in manholes;

(*d*) All stays, braces, and parts requiring staying;

(*e*) Flanges.

(*7*) In determining the maximum size of an unreinforced opening under Par. U-59(*a*), the value of *K* to be used in connection with the chart in Fig. U-5 shall be 1.1 times the value of *K* computed by the formula of that paragraph for that part of the shell that contains the opening. Where *K*, so computed, is unity or greater, the maximum size of an unreinforced opening shall be 2 in.

For the chrome-nickel materials covered by Case No. 897, the increased stresses and joint efficiencies are permitted up to a temperature not to exceed 900 F, but within the other temperature limitations of that Case.

Pars. U-68 and U-69 vessels constructed in accordance with the requirements of this Case and other applicable Code rules are considered safe and shall be stamped in accordance with Par. U-66, the Code symbol to be followed by the letters "NE," which also shall be shown on the manufacturers' data report.

This Case shall be effective until it is annulled, revised, or Code revisions made.

CASE No. 983

(Special Ruling)

Inquiry: In view of the restrictions affecting the availability of the usual grades of bolting material, will the following additions and extensions of Tables P-7 and U-2 meet the intent of the Code:

(*1*) Heat-treated carbon steel bolting materials;

(*2*) Manganese steel bolting material;

(*3*) Bolting steels to suitable National Emergency specifications;

(*4*) Increase of the temperature limit on type B7, A.S.T.M. Specifications A193-40T, to 1000 F.

Reply: Certain of the steels listed are new and complete data as to the high temperature strengths are not available, making it necessary for the Committee to exercise judgment in establishing the acceptability of these substitutes. It is the opinion of the Committee that the following additions and extensions of Tables P-7 and U-2 are conservative, based on the advice of the Subcommittee on Ferrous Materials and other competent metallurgical experts, and may be accepted as meeting the intent of the Code:

(*1*) Medium-carbon steel of SAE 1000 series, with a silicon content of 0.10 per cent minimum, heat-treated to meet the requirements of Specification S-9, class A, may be used as bolting with the following stresses:

650 F	700 F	750 F	800 F	850 F
13000	11950	10000	8000	5500

NOTE: Between temperatures of —20 F to 400 F, stresses equal to the lower of the following will be permitted: 16 per cent of tensile strength; 20 per cent of yield point stress.

(*2*) Manganese steels of SAE 1300 series or equal, with a manganese content of 1.90 per cent maximum, heat-treated to meet the requirements of Specification S-9, class B, may be used as bolting with the following stresses;

650 F	700 F	750 F	800 F	850 F	900 F
15000	13750	12500	10000	7800	5600

NOTE: Between temperatures of —20 F to 400 F, stresses equal to the lower of the following will be permitted: 16 per cent of tensile strength; 20 per cent of yield point stress.

(*3*) The following National Emergency steels are acceptable and may be used at the same stresses as are permitted for A.S.T.M. Specifications A193-40T, Grades B7 and B7a bolting:

B7	B7a
NE 8339	NE 8547
NE 8442	NE 8949
NE 8447	
NE 8739	
NE 8744	

(*4*) Bolting steels complying with A.S.T.M. Specifications A193-40T, Grade B7, and the alternate NE steels may be used to 1000 F with the following stresses for the extended temperatures

950 F	1000 F
6800	3600

(*5*) Note 11 of Tables P-7 and U-2 shall apply to all the above allowable stresses.

CASE No. 984

(Interpretation of Specifications S-1 and S-2)

Inquiry: In view of the increased demand for steel plate to the limit of capacity, certain easements in connection with Specifications S-1 and S-2 are desirable. It has become increasingly difficult to keep the sulphur content for firebox quality below the limits of 0.04 per cent as specified. Some heats slightly exceed this limit and it would save re-

jection of such heats, without materially impairing the quality of the plate, if this limit were raised to 0.045 per cent during the emergency. May such increase be interpreted as meeting the intent of Specifications S-1 and S-2 for firebox quality?

A considerable quantity of structural quality plates for ship hull construction is being made with a tensile range of 58,000 lb minimum to 70,000 lb maximum. The present limit for Specification S-1 plate is 55,000 to 65,000 lb per sq in. If the upper limit of this range were increased to 70,000 lb, it would be possible to utilize steel for both purposes from the same ingots and thereby increase the production of plate through such simplification. May the upper range of tensile strength for Specification S-1 plate be increased from 65,000 to 70,000 lb for flange and firebox qualities during the emergency?

Reply: In order to facilitate the production of steel plate and for a period extending not more than six months after a declaration of peace, it is interpreted that firebox quality plate to Specification S-1 or S-2 will meet the intent of these specifications and be acceptable under the requirements if the limit of sulphur does not exceed 0.045 per cent. Specification S-1 flange or firebox quality plate will be interpreted as complying with the specification if the tensile strength of the test specimen from the lower corner in the case of flange quality and from both the lower and upper corners in the case of firebox quality does not exceed 70,000 lb per sq in.

CASE No. 985

(Special Ruling)

Inquiry: In view of the difficulty in securing forged or cast butt-welding flanges, will it be permissible to use hubbed flanges or necks fabricated by welding in the construction of boilers and unfired pressure vessels?

Reply: It is the opinion of the Committee that it is permissible to build up hubbed flanges or necks by fusion welding for use in the construction of boilers and unfired pressure vessels, provided:

(1) The flanges are made of material recognized as weldable by this Code, except that hubbed flanges shall not be machine-cut from plate material;

(2) The welds are made in general accordance with the applicable details shown in Fig. UA-3 (1942 addenda);

(3) The manufacturer satisfies himself and the inspector that the welded flanges are equivalent in strength to the forged or cast flanges which they replace.

CASE No. 986

(Interpretation of Tables P-7 and U-2)

Inquiry: Shall quality factors for steel castings in excess of 70 per cent, as given in the footnote of Tables P-7 and U-2, be permitted with casting inspection in excess of that required by the specification for the material?

Reply: A casting quality factor as specified below shall be applied to the allowable stresses for steel casting materials as given in Tables P-7 and U-2:

(1) A factor of 70 per cent shall be applied when a casting is inspected only in accordance with the minimum requirements of the specification for the material.

(2) A factor of 80 per cent shall be applied when a casting is inspected both in accordance with the minimum requirements of the specifications for the material, and the following additional requirements are met:

Each casting shall be subjected to a thorough inspection of all surfaces, particularly such as are exposed by machining or drilling, without revealing any injurious defects. At least one pilot casting representing every lot of 100 shall be sectioned at all critical sections, or completely radiographed without revealing any injurious defects.

(3) A factor of 90 per cent shall be applied when a casting is inspected both in accordance with the minimum requirements of the specification for the material, and the following additional requirements are met:

Each casting shall be subjected to a thorough inspection of all surfaces, particularly such as are exposed by machining or drilling, without revealing any injurious defects. At least three pilot castings representing the first lot of five castings shall be sectioned at all critical sections, or completely radiographed without revealing any injurious defects.

One additional casting taken at random from every lot of five shall be sectioned at all critical sections, or completely radiographed, without revealing any injurious defects.

In addition, all castings other than those which have been radiographed shall have critical sections examined, using either the magnetic powder method, or grinding and etching.

In the case of a single casting, or any casting of a lot which has been completely radiographed and found free of injurious defects, the 90 per cent factor may be applied.

(4) Where machine work is done on a casting to such an extent that all vital areas are exposed for inspection for the full wall thickness, as in drilling tube sheets with holes spaced no further than the wall thickness of the casting, the inspection afforded shall be taken in lieu of destructive or radiographic testing required in (3) and a casting factor of 90 per cent shall be applied.

(5) Castings complying with ASA Standard B16e shall be used at the ratings assigned thereto in Par. P-299.

(6) *Pilot Castings.* A pilot casting shall be defined as any one casting, usually one of the first from a new pattern, poured of the same material and using the identical foundry procedure (risering, gating, pouring, and melting) as the castings it is intended to represent. Any pilot casting or castings taken to represent a lot and the castings of that lot shall be poured within one year.

(7) *Critical Sections.* The critical sections of a casting are defined as the sections where defects are usually encountered, such as the junctions of risers, gates or feeders to the castings, and abrupt changes in section.

(8) *Radiographing.* Radiographing, where required, shall conform to the "General Specifications for Inspection of Material, Appendix II—Metals, Part F—Radiography, Section F-1, Definitions and Radiographic Requirements, Navy Department, Washington, D. C., 1 March 1942, Preliminary Draft." Radiographic standards shall conform to the "Gamma Ray Radiographic Standards of the Bureau of Engineering for Steel Castings for Steam Pressure Service" prepared by the Materials Laboratory, Navy Yard, New York, September 1, 1938.

(9) *Defects.* Serious defects shall be the basis for rejection of the casting and the inspector shall have the right to demand a similar inspection of an additional casting where an 80 per cent quality factor is to be applied and any number of additional castings from the same heat where a 90 per cent quality factor is to be applied. Where defects not impairing the strength of the casting have been welded up, the completed repair shall be subject to reinspection, and for 80 or 90 per cent factor the repaired casting must be stress-relieved.

(10) *Identification.* Castings to which a quality factor of 80 or 90 per cent is to be applied shall be marked with manufacturer's and materials identification marking and in addition the applicable quality factor shall be clearly stamped on the casting. Mill test reports or certificates furnished by the manufacturer shall state that the castings conform to the requirements of this Case.

CASE No. 987

(Interpretation of Specification S-35)

Inquiry: There is a need for a new grade of material under Specification S-35, covering forged flanges for high-temperature service, that will be especially adapted to welded construction. Will material conforming to the following chemical and physical requirements, but in all other respects complying with the requirements of Specification S-35, meet the intent of the Code?

Carbon, max, per cent	0.27
Manganese, max, per cent	1.00
Phosphorus, max, per cent	0.04
Sulphur, max, per cent	0.05
Silicon, per cent	0.15 to 0.50
Molybdenum, per cent	0.40 to 0.60
Tensile strength, min, lb per sq in.	70,000
Yield point, min, lb per sq in.	37,500
Elongation in 2 in., min, per cent	25
Reduction of area, min, per cent	40

Reply: It is the opinion of the Committee that the new grade of material specified in the inquiry, otherwise complying with Specification S-35, will be acceptable.

CASE No. 988

(Interpretation of Specification S-4)

Inquiry: Will it be permissible to use forgings complying with Specification S-4 for boiler and pressure vessel forgings other than seamless drums, such as disks, heads, etc.?

Reply: In order to cover boiler and pressure vessel forgings other than seamless drums, it is proposed to revise Specification S-4 as follows:

Title: "Specifications for Steel Seamless Drums and Other Special Forgings for Pressure Vessels"

Par. 1 First sentence revised:

These specifications cover three grades of carbon-steel hollow-forged drums and other special forged parts for boilers and other pressure vessels.

Par. 4 Revised:

4 *Forgings.* (*a*) Hollow forgings shall be made from ingots that have been cast solid and then punched, bored, or hot trepanned. The walls of the hollowed ingot shall be reduced in thickness at least one half by forging on mandrels.

(*b*) Drums with one solid end shall be forged from ingots that have been cast solid and then punched. The thickness of the walls may be further reduced by drawing through dies or by any other method approved by the purchaser.

(*c*) Solid forgings shall be made from solid cast ingots.

Par. 9 Revised table of physical properties:

		Grade 1	Grade 2	Grade 3
Tensile strength, min, lb per sq in.		60,000	70,000	75,000
Yield point, min, lb per sq in.		0.5 tens. str.	0.5 tens. str.	0.5 tens. str.
Elongation in 2 in., min, per cent	(longitudinally)	26	24	24
	(tangentially)	23	21	21
Reduction of area, min, per cent	(longitudinally)	42	38	38
	(tangentially)	35	30	30

Par. 11 Revised:

11 *Test Specimens.* (*a*) Tension and bend test specimens shall be taken from full thickness prolongations of each forging after annealing as specified in Par. 8. Tension test specimens shall be of the form and dimensions shown in Fig. 1. Bend test specimens may be either $1/2$ in. square or 1 by $1/2$ in. in section with the corners rounded to a radius not more than $1/16$ in.

(*b*) For hollow forged seamless drums weighing over 7000 lb, one longitudinal tension test specimen shall be taken from each end of each forging; and one tangential bend-test specimen shall be taken from the end of the forging corresponding to the upper part of the ingot.

(*c*) For pierced seamless drum forgings weighing over 7000 lb, one longitudinal tension test specimen shall be taken from the open end and one tension test specimen, either longitudinal or tangential, at the option of the manufacturer, shall be taken from the solid forged end; and one tangential bend test specimen shall be taken from the end of the forging corresponding to the upper part of the ingot.

(*d*) Unless otherwise specified, tension test specimens for forgings other than those covered in (*b*) and (*c*) may be taken either longitudinally or tangentially. Bend test specimens shall be taken tangentially. Test specimens shall be located at the edge of heads and flat forgings. When two tension tests are required (See Par. 12), they shall be located 180 deg apart.

(*e*) The axis of test specimens shall be located midway between the inner and outer surfaces of the wall of hollow forgings, midway between the center and the surface of cylindrical solid forgings, and midway between the parallel surfaces of heads and flat forgings.

(*f*) The axis of longitudinal test specimens shall be parallel to the cylindrical axis of the forging. The axis of tangential test specimens shall be perpendicular to the cylindrical axis of the forging, and also perpendicular to the radius of the forging that intersects its mid-length point.

Par. 12(a) Revised:

(*a*) For forgings weighing over 7000 lb, or which are over 15 ft in length, two tension test specimens and one bend test specimen shall be taken from each forging. For lighter or shorter forgings, one tension test specimen and one bend test specimen shall be taken from each forging.

It is the opinion of the Committee that the proposed revisions of Specification S-4, as outlined above, are acceptable and material conforming thereto may be used in Code constructions.

CASE No. 989

(Special Ruling)

Inquiry: May chromium steels be used in the construction of welded unfired pressure vessels under the A.S.M.E. Code rules?

Reply: Chromium steels may be used in the construction of welded unfired pressure vessels in accordance with the rules of Par. U-68 of the Code with the following limitations:

(*1*) *Material Specifications.* Material shall conform to the following specifications:

Item	Specification number	Grade or class	A.I. S.I. type no.
Sheets and plates	S-61	2	410
Sheets and plates	S-61	4*	430
Forgings	S-35	F6	410
Forgings	S-35	***	***
Pipe	S-34	P6**	410
Castings	A.S.T.M. A221-39	A	410

* Chromium not more than 16 per cent.
** Tungsten to be omitted.
*** The material shall conform with Specification S-35 in so far as applicable, except the chemical requirements shall comply with those specified above for sheets and plates, Grade 4, type 430.

(*2*) *Heat Treatment.* Although a welding preheat of at least 300 F is usually found necessary in order to avoid welding cracks, it is not made mandatory since successful results have been obtained without preheat, particularly in the case

of light plates. When preheating is employed, the stress-relieving heat treatment specified below should preferably follow without intermediate cooling:

The vessel shall be stress-relieved at a temperature of not less than 1350 F nor more than 1500 F. The soaking time shall be of sufficient length to produce satisfactory ductility in the weld metal. Cooling shall be in the furnace until a temperature of 1000 F is reached and at a rate not higher than 100 F per hr, after which cooling in still air is permitted. The test plates shall be heat-treated in the furnace with the vessel.

(3) *X-Raying.* X-raying of the welded seams shall be done after a stress-relieving heat treatment, either interstage or final. The final radiographs of any seam repair welds shall be made after the repairs have been stress-relieved.

(4) *Allowable Working Stresses.* The allowable working stresses for all these materials shall be those given in Table U-2 for Grade 2 of A.S.T.M. A176-41 (S-61).

(5) *Weld Metal.* The analysis of the deposited weld metal shall be substantially the same as that of the base material.

CASE No. 990

(Special Ruling)

Inquiry: There is no specification in the Code covering iron and steel gas-welding rods. Since A.S.T.M. Specifications A251-42T for Iron and Steel Gas-Welding Rods have been released, may gas-welding rods complying with that specification be used in the construction of Code vessels?

Specification S-63 for Iron and Steel Arc-Welding Electrodes is identical with A.S.T.M. Specifications A233-40T. However, A.S.T.M. Specifications A233 have been revised and are now designated as A233-42T. May electrodes conforming to these latest A.S.T.M. Specifications be accepted for use in Code constructions?

Reply: It is the opinion of the Committee that gas-welding rods complying with A.S.T.M. Specifications A251-42T, and arc-welding electrodes complying with A.S.T.M. Specifications A233-42T, will be acceptable for use in Code construction.

Errata

On pages 339 of the 1942 Power Boiler Code addenda and 289 of the 1942 Unfired Pressure Vessel Code addenda, the value of t in Pars. A-125(b) and UA-100(b) should read as follows:

$$t = (\sqrt{z}-1)\,R = 2\left(\frac{\sqrt{z}-1}{\sqrt{z}+1}\right)R_M = \left(\frac{\sqrt{z}-1}{\sqrt{z}}\right)R_O$$

REVIEWS OF BOOKS

And Notes on Books Received in the Engineering Societies Library

Surface Finish

SURFACE FINISH. By George Schlesinger. Institution of Production Engineers, London, England, 1942. Cloth, $5\frac{1}{2} \times 8\frac{3}{4}$ in., 231 pp., illus. American edition published by The American Society of Mechanical Engineers, New York, N. Y., $3.25.

REVIEWED BY J. T. BURWELL, JR.[1]

AS STATED in the introduction, this book is a report of an investigation of surface finish by the research department of the Institution of Production Engineers. One of the two main problems with which this investigation was concerned and which is dealt with in the present report is the provision of standards for the measurement of surface finish. The second problem, namely, the determination of the type of finish best suited to any given application, will presumably be treated in a later report.

The method used in the reported work for determining the proper standards of surface-finish measurements was to obtain specimens of typical finishes on various production parts of the principal machine industries and make roughness measurements on them by a few selected methods. These data are collected into a table listing 436 different surface measurements. The table lists for each measurement the machine part, such as a spiral gear or piston pin, the material of which it was made, its function and fit, the operation by which the surface was finished, and then several measured or derived parameters describing the surface roughness. These include the average height or depth of the surface from a central plane, the root-mean-square height or depth, the maximum distance from crest to trough, and relations between these quantities. Finally, the roughness class is given based on a proposed British standard for specifying surface roughness.

Studies of these data are made as regards the range of roughness found for any one specimen surface, the range for several individuals of the same class of parts, the range for many different parts made in the same industry, and the range for the same type of finishing operation as applied in different industries. Studies were made of the surface-measuring instruments used in obtaining these data. The reproducibility of the measurement, its sensitivity to extraneous influences, and the effect of the measuring instrument on the measurement were examined. As a result of this experimental work the report proposes a British standard and symbols for specifying surface roughness in the machine industries. It consists of thirteen roughness classes. Class No. 0 includes those surfaces having an average height or depth from a central plane of from 0 to 1 microinch. Class No. 1 includes those from 1.1 to 2 microinches. Class No. 2 includes those from 2.1 to 4 microinches. They proceed in this way, the two extremes of roughness in any one class differing by approximately a factor of two, up to Class No. 12 which includes roughness from 2001 to 4000 microinches. The finish of any surface on a drawing shall be described by the roughness class number and a letter designating the type of finishing operation, such as *T* for turning, *DB* for diamond boring, or *L* for lapping.

In addition to the table of results together with their discussion and conclusions as just described, the report includes a chapter describing the instruments used.

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Since another review of this same report was published in July, The American Society of Mechanical Engineers has entered into an arrangement with the Institution of Production Engineers for publication of an American edition of the report. This edition is now available.—EDITOR.

The three main ones used were the Abbott profilometer, the Taylor-Hobson surfacemeter, and the Schmaltz profile microscope. The Abbott instrument is familiar to most of the American industry. The Taylor-Hobson surfacemeter appears to resemble the Brush surface analyzer except for the fact that it uses a type of electromagnetic pickup rather than a crystal one. The Schmaltz profile microscope throws a narrow slit of light on the test surface and views the shadow edge through an optical system. The result essentially is to take an optical section of the surface and is completely nondestructive. Several other comparison instruments were used to a lesser extent.

Another chapter is devoted to a rather thorough experimental study of the effect of the scratching action of the stylus of a tracer type of instrument on the measured roughness. This is probably one of the most valuable contributions of the work. A chapter is devoted to qualitative systems of classifying roughnesses of surfaces, such as by their brightness, their feel, and other methods. A chapter is entitled "Dimension and Surface Roughness of Gauges," but in reality its subject matter is much broader since it deals with the relationship of surface roughness of mating parts to their fit and mentions the effect of roughness on the running-in and friction of rubbing parts. Finally, there is a separate chapter describing the investigation of surface roughness in the United States, the major part of which is devoted to a description of the Chrysler superfinishing process.

In commenting on this book it should be principally borne in mind that this is a report on a particular experimental investigation and is in no sense a comprehensive work dealing with all phases of the subject of surface finish. That this is so is evident merely from a glance at the arrangement of the subject matter, the results and conclusions being at the beginning as is proper for a report. The tracer type of roughness measurement is treated in most detail since this type of instrument was actually used in the work, while optical methods are discussed only briefly, and other methods such as that of tapered sectioning are not mentioned at all. Only the roughness of surfaces which are designed to run or fit against another surface was treated. Other situations where surface finish may be important, such as in fatigue resistance, heat transfer, and the like, were not discussed at all.

Bearing in mind then that this is an account of an investigation leading to certain conclusions and recommendations let us discuss the final conclusion, namely, a proposed standard of surface roughness. Comparing this with the standard proposed in this country by the Sectional Committee B.46 organized under the procedure of the American Standards Association, it is noted that the British standard is based on the average roughness while the American one is based on the root-mean-square roughness. The argument in favor of the former is that it can be as easily measured by electrical instruments as the latter, that for the wide range of surfaces studied in this work the two did not differ much numerically, and, finally, that it was a quantity that was more easily understood by the "production people." Examination of the 153 surfaces on which both the average and the root-mean-square roughness were measured shows that in 42.5 per cent of the cases the two differ numerically by less than 10 per cent; in 10 per cent of the cases the two differ by more than 100 per cent in either direction; and the remaining 47.5 per cent of the cases are distributed between these two extremes. It would appear then that these two roughness parameters do differ appreciably in numerical value. Whether this is of practical significance only correlation with actual service can tell. Until such correlation can be made it will be extremely difficult to say whether the average roughness or the root-mean-square roughness is the more proper quantity to specify, and, indeed, it may turn out that one is more closely related to some types of service while the other is to other types.

Further comparison of the two standards shows that the British one specifies two quantities, i.e., the roughness and the type of finish which this reviewer considers a distinct advantage, but the roughness is only specified within an octave by its roughness class number. As already mentioned, the question of whether the specification of roughness to within a factor of two is sufficient will have to await a detailed study of the effect of roughness on various performance characteristics.

One of the best sections of the report deals with a discussion of the effect of surface roughness of mating parts on the quality of fits, particularly interference and transition fits. A good discussion is also given of the surface roughness on the anvils or measuring surfaces of gages and its relation to the accuracy of the gage and the change of accuracy with wear.

The statement that roughness measurements of less than about 8 microinches, particularly when made with a tracer type of instrument, should be treated with caution as regards their actual values is well taken. Such figures can probably only be used for comparing similar surfaces which were measured by the same instrument.

In the description of the superfinishing process one of its most distinguishing characteristics was omitted. In honing or mechanical lapping removal of material continues as long as the process is carried on unless a mechanical stop is interposed. In the superfinishing of simple shapes such as cylinders or flats, however, the increasing smoothness of the work, as the operation progresses, permits a fluid film of the cutting fluid to be gradually built up which will, when the surface has become sufficiently smooth, lift the lightly loaded abrasive stone completely from the work through hydrodynamic action and further cutting. As a result very little stock need be allowed for this finishing operation and the length of time allowed for superfinishing is not critical. This and the ability to produce surfaces comparable in smoothness with lapped ones by quantity-production methods are the two characteristics that chiefly distinguish superfinishing from other fine-finishing operations.

In this same description of superfinishing much is said about the deleterious effects of the badly disturbed surface layer of metal produced by the conventional finishing operations. A word of caution is in order here. While it is certainly true that superfinishing with its lightly loaded stones and slow speed will produce a quite different surface metallurgy from that produced by dry surface grinding, too little is definitely known to make the categorical statement that either surface condition is superior to the other for any particular type of service.

As an account of a particular investigation which undertook to answer certain questions on the subject of surface finish this report is indeed valuable. It does not pretend to be a complete account of the subject and perhaps it is still too early for any such account to be written. Moreover, this report is even more valuable as indicating the definite interest of the industry in this important subject. It is to be hoped that the research program of which this is a part will be continued.

Books Received in Library

FOUNDRY WORK. By R. E. Wendt. Fourth edition. McGraw-Hill Book Co., Inc., New York, N. Y., and London, England, 1942. Cloth, 5 × 8 in., 261 pp., illus., diagrams, charts, tables, $2. This book is intended for use as a textbook by college students and apprentices in shops and aims to present the fundamental principles and give a general working knowledge of foundry practice. The fourth edition contains new exercises in molding and discusses the causes of defective castings.

14,000 GEAR RATIOS. By R. M. Page. Industrial Press, New York, N. Y.; Machinery

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Publishing Co., Brighton, England, 1942. Fabrikoid, $8\frac{1}{2} \times 11\frac{1}{2}$ in., 404 pp., diagrams, tables, $5. The four sections of this book give: Common fractional ratios and their decimal equivalents; decimal ratios, their logarithms and equivalent pairs of gears; total number of teeth with equivalent gear pairs and ratios; numbers and equivalent gear factors. The tables cover all ratios from 1/120 to 120/2, thus providing over fourteen thousand ratios. The various uses of the tables are illustrated by examples. The book will be of practical value to engineers and designers.

GENERAL TRADE MATHEMATICS. By E. P. Van Leuven. McGraw-Hill Book Co., Inc., (Whittlesey House), New York, N. Y., 1942. Cloth, $6 \times 9\frac{1}{2}$ in., 575 pp., illus., diagrams, charts, tables, $3.50. The mathematics needed to solve actual shop problems in manufacturing and mechanical operations is presented in a step-by-step manner for quick grasp and practical use. Beginning with various straight arithmetical operations, the book works through simple algebra and geometry to specific industrial calculations. A wealth of practical problems furnishes useful practice material.

HANDBOOK OF CIVILIAN PROTECTION. Edited by L. L. Snyder, R. B. Morris, and others. McGraw-Hill Book Co., Inc. (Whittlesey House), New York, N. Y., 1942. Fabrikoid, $5 \times 7\frac{1}{2}$ in., 184 pp., illus., diagrams, tables, $1.25. This little book provides the basic information concerning protection in air attacks which the general public should have. In simple language it gives definite advice on air-raid conduct and services, fire fighting, incendiary bombs, poison gas, first aid, civilian conservation and salvage, and wartime nutrition. There is a bibliography.

MECHANICS OF AIRCRAFT STRUCTURES. By J. E. Younger. Second edition. McGraw-Hill Book Co., Inc., New York, N. Y., and London, England, 1942. Cloth, $6 \times 9\frac{1}{2}$ in., 396 pp., illus., diagrams, charts, tables, $4. The fundamental principles and methods involved in the construction of all-metal airplanes are presented in organized form and as simply as possible for student use. The data upon design and structural analysis are recent. The first edition published in 1935 was entitled "Structural Design of Metal Airplanes."

MOTION AND TIME STUDY APPLICATIONS. By R. M. Barnes. John Wiley & Sons, Inc., New York, N. Y., 1942. Paper, $8\frac{1}{2} \times 11$ in., 188 pp., illus., diagrams, charts, tables, $1.75. This volume supplements the author's "Motion and Time Study" by providing case material and research data illustrative of that text. Much of the material here is the result of researches in the application of motion and time study to specific problems, as carried on at the University of Iowa.

National Physical Laboratory, Metrology Department, NOTES ON GAUGE MAKING AND MEASURING. Great Britain, Department of Scientific and Industrial Research, London, January, 1942. Paper, 7×10 in., 68 pp., diagrams, charts, tables, (obtainable from British Library of Information, New York, N. Y., $0.60) This pamphlet has been prepared by the National Physical Laboratory for the assistance of firms who are entering the field of gage making, as a guide in overcoming initial difficulties. It includes notes on the manufacture and measurement of gages, together with descriptions of suitable measuring apparatus. The text covers the simpler types of plain and form gages but does not consider screw gages.

PLASTICS. By J. H. DuBois. American Technical Society, Chicago, Ill., 1942. Cloth, $5\frac{1}{2} \times 8\frac{1}{2}$ in., 295 pp., illus., diagrams, charts, tables, $3. This book is written for users of plastics who wish practical information concerning these materials. The history and origin of the various types and the sources of their raw materials are explained. Their physical, chemical, and electrical properties are discussed as well as their advantages and defects. Due attention is paid to their fabrication, and information on design is presented. The work will be very useful to engineers and designers.

PETROLEUM ENCYCLOPEDIA, "Done in Oil." By D. D. Leven, edited and revised by S. J, Pirson. Ranger Press, New York, N. Y., 1942. Fabrikoid, 6×9 in., 1084 pp., illus., diagrams, charts, maps, tables, $10. A comprehensive presentation of the whole oil industry, with emphasis upon the economic and financial aspects. The place of petroleum in world economics; methods of finding, producing, transporting, refining, and marketing oil; oil-industry financing; the oil royalty business; and the regulation of securities and markets are described in clear, nontechnical language.

PRINCIPLES OF MAGNAFLUX INSPECTION. By F. B. Doane. Second edition. Magnaflux Corporation, Chicago, Ill., 1942. Cloth, 6×9 in., 288 pp., illus., diagrams, charts, tables, $2.50. The principles of this method of inspection, its advantages, its fields of use, and its technique are presented. This new edition has been enlarged and improved. More photographs of Magnaflux patterns have been included; new material has been added on detectable defects, interpretation, and welding; and the bibliography has been enlarged.

RATIONED RUBBER, What to Do About It. By W. Haynes and E. A Hauser. Alfred A. Knopf, New York, N. Y., 1942. Cloth, 5×8 in., 181 pp., diagrams, charts, $1.75. In this small book, intended for the man in the street, two experienced chemists give a clear, readable account of the rubber situation today.

Report of a Conference on the ORIGIN OF OIL, conducted by the Research Committee of the American Association of Petroleum Geologists, April 5, 1941, Houston, Texas. Publication by American Association of Petroleum Geologists, P. O. Box 979, Tulsa, Okla., 1941. Paper, $8\frac{1}{2} \times 11$ in., 81 pp., illus., tables, manifold, $1. The pamphlet is a stenographic report of an informal round-table discussion at Houston, Texas, on April 5, 1941, which was attended by thirty-six well-known geologists and chemists interested in the subject.

REPORT WRITING. by C. G. Gaum, H. F. Graves, and L. S. S. Hoffman. Revised edition. Prentice-Hall, New York, N. Y., 1942. Cloth, $6 \times 9\frac{1}{2}$ in., 332 pp., diagrams, blueprints, charts, tables, $2.75. This is an excellent presentation of certain principles of composition and rhetoric to the special field of the report, intended for use as a college text and for independent study. No fundamental changes have been made in the new edition, but the illustrative material and specimen outlines and reports have been replaced by recent items, the rules for abbreviations have been changed to standard ones, and a section on letters of application has been added.

REPORTS ON PROGRESS IN PHYSICS, Vol. 8 (1941), edited by W. B. Mann. Physical Society, Exhibition Road, London, S.W.7, England, 1942. Cloth, 7×10 in., 372 pp., illus., diagrams, charts, tables, $5.25, postage included. The purpose of these valuable reports is to help the physicist to keep himself informed of the advances constantly being made in those departments of physics in which he has not specialized. To this end, each annual volume contains papers by specialists upon various important fields, accompanied by extensive bibliographies. This volume deals with advances in physics up to the middle of 1941.

SHEET-METAL PATTERN DRAFTING. By F. J. O'Rourke and edited by J. A. Moyer. McGraw-Hill Book Co., Inc., New York, N. Y., and London, England, 1942. Cloth, $6 \times 9\frac{1}{2}$ in., 189 pp., diagrams, charts, tables, $2. This text is intended to familiarize the reader with the basic principles that must be applied in laying out patterns on sheet metal. These principles are illustrated by application to many practical problems of the various kinds that arise in everyday shopwork.

SHIP REPAIR AND ALTERATION. By G. V. Haliday and W. E. Swanson. Cornell Maritime Press, New York, N. Y., 1942. Leather, $5\frac{1}{2} \times 7$ in., 378 pp., diagrams, charts, tables, $2.75. The handbook is a practical reference work for shipfitters, especially those engaged in altering and repairing ships. Part one describes methods of carrying out hull repairs of all kinds. Parts two and three present the mathematical and geometric knowledge needed by the shipfitter. Part four deals with the development and layout of sheet-metal work. There are mathematical tables and a glossary of shipbuilding terms and abbreviations.

SOURCE BEDS OF PETROLEUM. By P. D. Trask and H. W. Patnode. American Association of Petroleum Geologists, Tulsa, Okla., 1942. Cloth, $6 \times 9\frac{1}{2}$ in., 566 pp., diagrams, maps, tables, $4.50. This book is the report of an investigation carried out jointly by the American Petroleum Institute and the U. S Geological Survey during the last ten years upon the origin and environment of source beds of petroleum. The properties of individual samples of sediments from many oil fields in most of the producing regions of the United States were studied in order to ascertain whether or not any of these properties were related to the distance of the sediments from known oil zones. The regional studies are presented in detail, with the conclusions reached.

STRENGTH AND PROPERTIES OF MATERIALS. (Rochester Technical Series.) By J. Elberfeld. Harper & Brothers, New York, N. Y., and London, England, 1942. Cloth, $6 \times 9\frac{1}{2}$ in., 150 pp., illus., diagrams, charts, tables, $1.75. This textbook aims to present, in one small volume, the essential information on materials needed by those engaged in the various industries and is intended as preparation for courses in tool, machine, and structural design. Only elementary mathematics is necessary.

Library Services

ENGINEERING Societies Library books may be borrowed by mail by A.S.M.E. members for a small handling charge. The Library also prepares bibliographies, maintains search and photostat services, and can provide microfilm copies of any item in its collection. Address inquiries to Harrison W. Craver, Director, Engineering Societies Library, 29 West 39th St., New York, N. Y.

A.S.M.E. NEWS

And Notes on Other Engineering Activities

A.S.M.E. 1942 Annual Meeting Gets Under Way at Hotel Astor Monday, November 30

WHAT promises to be the biggest A.S.M.E. Annual Meeting ever held will be under way by the time this issue reaches readers living at some distance from New York. A few years ago the decision was made to hold Annual Meetings at the Hotel Astor because the facilities of the Engineering Societies Building, in spite of changes made to increase the number of public rooms, had become inadequate for the extensive program which is built up on a pattern of five concurrent sessions. In order not to overcrowd the facilities of the Astor, an extra day, Friday, has been added to the program of technical sessions.

Visit to Wright Paterson Plant

Arrangements are being made by the Committee on Plant Trips for a visit to the Wright Aeronautical Company, at Paterson, N. J., manufacturers of the famous *Cyclone* aviation engines. All persons wishing to make this trip should provide evidence of citizenship.

Plant Visits for Individuals

Owing to increasing restrictions on admission to laboratories and plants where war work is in progress, the usual program of plant visits offered to members in attendance at the Annual Meeting has been drastically modified. It will be obvious to most engineers that great difficulties lie in the way of getting permission from the many departments of the government for whom work is being done to conduct inspection trips of large groups. Regulations of the Office of Defense Transportation make it impossible to charter busses or other means of travel for the transportation of large groups of visiting engineers from the headquarters to the plants. Although individually engineers in the metropolitan area are as hospitable and friendly as in any other part of the country, they are, under present conditions, greatly restricted in time and man power needed for intelligent guide service.

It is planned to set up, at the headquarters at the Astor, an information and registration service to assist visitors *individually* in getting into plants they may desire to visit. Proof of citizenship will be required in all cases, and any person expecting to get into a plant or laboratory engaged in war work should come prepared to identify himself. Although the committee cannot guarantee that it will be successful in every case, it is prepared to make the effort to gain admission to plants by properly qualified individuals.

Production Engineering Session Shifted

A shift of the session on production engineering, announced in the preliminary program printed in MECHANICAL ENGINEERING as to be held on Tuesday afternoon at 2:30, has been made. This session will be held on Tuesday evening, at 8 o'clock, instead of Tuesday afternoon. At this session, Thornton Lewis, deputy chief, Production Service Branch, Industrial Division, Ordnance Department, will present a paper, "Conversion in Ordnance," and W. W. Gilbert and A. M. Lennie will discuss the drilling of deep holes in magnesium alloys.

Man Power at Engineering Level

Attention is directed to the panel discussion, on Friday afternoon at 2 o'clock, of the manpower problem at the engineering level. At other sessions throughout the meeting questions of man power will be discussed also, but the Friday afternoon session will be of particular interest to engineers and educators because it is concerned with the problem of man power at the engineering level. Most of the public discussion in the press has to do with broader aspects of the problem as they are related to workers in general in industry, agriculture, and transportation, and services. The problem of man power at the college level is particularly significant to engineers because it concerns them and their profession in a vital manner. Although the names of members of the panel have not been announced, it can be promised that they will be representative of a wide variety of agencies which use, or are interested in, college-trained engineers.

To Open With "Ingenuity"

Last minute reminder of the opening session of the Annual Meeting is called for because, under wartime conditions, tickets for the luncheon on Monday must be purchased in advance. As announced last month, Monday's luncheon will precede a session on "Ingenuity" at which the famous airplane designer, Igor Sikorsky, will be the principal speaker. Motion pictures of Mr. Sikorsky's fascinating helicopter will be shown and Mr. Sikorsky will speak on one of his hobbies, "Creative Engineering, Invention, and Intuition." Chester I. Barnard, of the New Jersey Bell Telephone Company, A. R. Cullimore, of the Newark College of Engineering, Lawrence Langner, of the Inventors' Council, and K. K. Paluev, of the General Electric Company, will lead the discussion following Mr. Sikorsky's address. A second session, at which several engineers will discuss what can be done about discovering and developing ingenuity, is scheduled for Monday evening.

Get Meal Tickets a Day Ahead

Because of wartime conditions, reservations for tickets for scheduled luncheons and dinners must be made by one o'clock, p.m., on the day *before* the luncheon or dinner is to be held. This means, for example, that tickets for the Annual Dinner on Wednesday evening, Dec. 2, must be purchased *before* 1 p.m. on Tuesday, Dec. 1. It also means that reservations for the luncheon on Monday, Nov. 30, must be received at A.S.M.E. Headquarters before 1 p.m. Friday, Nov. 27.

Official Notice

A.S.M.E. Business Meeting

THE Annual Business Meeting of the members of The American Society of Mechanical Engineers will be held Monday afternoon, November 30, 1942, at 4:00 p.m. at the Hotel Astor, New York, N. Y., as a part of the Annual Meeting of the Society.

(*Signed*) C. E. DAVIES
Secretary

1943 A.S.M.E. Nominating Committee to Meet on Dec. 3

THE Organization Meeting of the 1943 National Nominating Committee of The A.S.M.E. will be held on Thursday, December 3, 1942, in Room K, Hotel Astor, 44th Street and Broadway, New York City at 9:30 a.m.

Actions of A.S.M.E. Executive Committee

At Meeting in Society Headquarters on Oct. 11

A MEETING of the Executive Committee of the Council of The American Society of Mechanical Engineers was held in connection with the A.S.M.E. Fall Meeting, Oct. 11, 1942, at the Hotel Sagamore, Rochester, N. Y. James W. Parker presided, and there were present: Clarke Freeman, vice-chairman, George E. Hulse, Thomas S. McEwan, and Clair B. Peck, of the Committee; William G. Christy, Harvey N. Davis, Paul B. Eaton, James H. Herron, and Edwin B. Ricketts, of the Council; Harold V. Coes, president-elect; A. L. Kimball and Frederick G. Switzer (Meetings and Program); C. E. Davies, secretary, and Ernest Hartford, executive assistant secretary.

The following actions were of general interest.

Honors and Awards for 1942

Upon recommendation of the Board of Honors and Awards the following honors and awards for 1942 were approved:

A.S.M.E. Medal, Ervin George Bailey
Holley Medal, Ernest Orlando Lawrence
Worcester Reed Warner Medal, Fred Herbert Colvin
Melville Medal, J. Kenneth Salisbury
Pi Tau Sigma Award, John Theodore Rettaliata
Junior Award, Winston Mansfield Dudley
Postgraduate Student Award, Arthur Wilfred McClure
Undergraduate Student Award, Joseph Packard Laird.

Standards

Upon recommendation of the Committee on Standards it was voted to adopt as standard practice of the Society and to transmit to the American Standards Association for approval as American Standards the proposed Graphical Electrical Symbols for Architectural Plans and the proposed Graphical Symbols for Electric Power, Control, and Measurement.

War Production Committee

On behalf of the War Production Committee which has recently met with officers of the Ordnance Department at Washington, D. C., and Aberdeen, Md. (see MECHANICAL ENGINEERING, November, 1942, page 818), the Committee voted to express its sincere appreciation to Major General L. H. Campbell, Chief of Ordnance, for his splendid courtesy to the War Production Committee; to ask the War Production Committee to develop an aggressive program, and to direct the staff to support the Committee in the development of a program and carrying it out.

E.C.P.D. Man Power Resolution

The secretary reported a resolution adopted by the Engineers' Council for Professional Development on engineering man power for the war. The Committee concurred in the resolution and expressed the view that E.C.P.D was taking the necessary steps to bring the manpower problem to the attention of the authorities. The resolution follows.

In modern, mechanized warfare, the need for engineers and scientists in war industries and in the fighting forces is out of all proportion to the relatively small number available, or in prospect. This is particularly true of the United States which must not only supply its own forces but serve as an arsenal for the democratic forces of the world.

It is, therefore, of vital importance to the country both to conserve this talent and to distribute it where it will best serve the total war effort. Other countries have already found this necessary.

The wastage of technical talent by its diversion to services where technical skill is not essential or by a failure to use the available training facilities to the full, can add but little to the man power of the armed forces and yet may do irreparable damage; for without adequate technical equipment and skill, armies and navies are helpless.

To meet this situation, the following steps should be taken:

1 Conserve and put to most effective use our existing staffs of engineers in the industries producing war materials; and in the engineering schools training young men for specialized services in the armed forces and in the war industries.

2 Adapt all engineering, science, and management courses in colleges to the needs of war both in the armed services and in war industries.

3 Allocate engineers to each war activity on the basis of its relative needs, considering both the armed forces and the war industries. This allocation process should provide for those who plan to study engineering, for engineering students, engineering teachers, and engineers of mature experience.

4 Encourage women to undertake engineering and science courses in college.

5 Continue the support of the E.S.M.W.T. program.

6 Recognize the fact that the assignment of all able-bodied engineers to the armed forces where some may be called on to render service in fields where their training will not be used is a misdirection of skill and is not in the best interest of the total war effort.

Additional Curricula Are Accredited by E.C.P.D

NOTRE DAME and the University of Toledo have been added to the list of United States colleges whose engineering courses have been accredited by the Engineers' Council for Professional Development, joint agency of eight engineering societies in the United States and Canada. At Notre Dame, curricula in aeronautical, civil, electrical, mechanical, and metallurgical engineering have been accredited; and at the Toledo school, the course in general engineering. Additional curricula have also been inspected and accredited by Council at twelve other colleges: chemical engineering at Bucknell (Lewisburg, Pa.); mechanical engineering at Catholic University of America (Washington, D. C.); chemical engineering at Cooper Union Night School of Engineering (New York City); chemical engineering at the University of Florida (Gainesville); ceramic engineering at Georgia Tech. (Atlanta); geological engineering at Idaho (Moscow); chemical engineering at Maryland (College Park); chemical engineering at Northeastern (Boston); chemical engineering at Oregon State (Corvallis); aeronautical engineering at Texas A.&M. (College Station); civil, electrical, and mechanical engineering at Southern California (Los Angeles); and chemical engineering at Worcester, Tech. (Worcester, Mass.).

Increased importance and popularity of chemical engineering is attested by the fact that one third of the 20 new curricula accredited are in that category. Aeronautical engineering, another comparatively new field, is recognized in approved courses at two schools; and the comparatively rare curricula in ceramic and geological engineering have one representative each in the list of 20. A total of 577 engineering curricula in 131 colleges and universities in the continental United States have now been accredited by E.C.P.D. through the inspection program of its Committee on Engineering Schools in the last decade. Only degree-granting schools are considered.

For an account of the 1942 Annual Meeting of E.C.P.D. see pages 894–898 of this issue.

The Chinese Institute of Engineers Reorganizes

THE Chinese Institute of Engineers has a history of over twenty years. It was first organized in the United States in 1919 under the name of Chinese Engineering Society. Later, it was reorganized in China under the new name of Chinese Institute of Engineers (C.I.E.) with an America Section in this country.

After the outbreak of war with Japan, most of the members in America were called back to duty in China and thus the America Section of C.I.E. remained rather inactive during the last few years. Realizing the importance of reviving such activities, the Chinese engineers in this country recently resolved to give the America Section of C.I.E. a new start. A convention was held in New York in August and the following officers were elected: President, L. F. CHEN; vice-presidents, A. T. LIU and P. H. CHIN; Executive officers, T. C. HSIUNG, C. H. TANG, and C. H. WANG.

The members of the America Section of C.I.E. are classified into the following groups: (1) Mechanical engineering, (2) electrical engineering, (3) civil engineering, (4) chemical engineering, (5) mining and metallurgical engineering, and (6) aeronautical engineering.

Local chapters are now being organized and the total number of members is expected soon to reach three to four hundred.

Besides arranging for local engineering lectures and discussions and also publishing a bimonthly "C.I.E. News Bulletin" and a "*C.I.E. Engineering Journal*," contacts have recently been established with several leading engineering societies and institutes here with a view to exchange publications, to arrange for or participate in special lectures and, in general to assist and give strength to this newly revived organization of Chinese engineers, the only one of its kind in this country.

Aviation Medicine and Dehydration of Food Topics at A.A.A.S. Engineering Sessions New York, Dec. 30

SECTION M (Engineering) of the American Association for the Advancement of Science will hold its sessions in connection with the 1942 Annual Meeting of A.A.A.S. on Wednesday, December 30, at the Hotel Commodore, New York, N. Y.

Willis R. Woolrich, dean of engineering, University of Texas, and member of the Council of The American Society of Mechanical Engineers, will address Section M at a luncheon to be held at the Commodore on Wednesday noon. His subject will be "The Romance and Engineering of Food Engineering." Dean Woolrich is the retiring vice-president of Section M. Thorndike Saville, dean of engineering, New York University, who succeeds Dean Woolrich as vice-president of Section M, will preside at the luncheon.

The 1942 program of Section M will feature two important subjects in fields where engineering must lean heavily on science. At the morning session the subject will be aeromedicine. Two of the three papers will be presented by members of the medical profession and the third by two engineers.

Following the luncheon, the afternoon session will be devoted to the dehydration of foodstuffs. The three papers will cover the theory of processes, the application of the theory to manufacture, and military and civilian practice.

It is the object of Section M to present papers on subjects on the frontier of engineering development which are based on recent applications of science. Engineers have abundant opportunity to discuss engineering subjects among themselves but there is still opportunity for a forum in which engineers can meet with doctors and other scientists, as well as workers in economic and social fields, to contribute jointly to an interchange of knowledge. The program of the New York meeting well illustrates how effective collaboration can be attained.

The program of Section M follows.

Morning Session, 9:30 a.m.
Hotel Commodore

1 "The Tilting Ballistocardiograph: Apparatus for Recording the Thrust of the Heart," Robert W. Wilkins, M.D., Department of Clinical Research and Preventive Medicine, Robert Dawson Evans Memorial, Boston, Mass.

2 "Development of Instruments for Test and Classification of Flight Personnel," by E. Lodwig, chief engineer, and J. Zaleski, design engineer, Mobile Refrigeration, Inc., New York, N. Y.

3 "The Application of Engineering Principles to Clinical and Aviation Medicine," by Alvan L. Barach, M.D., associate professor of clinical medicine, Columbia University, New York, N. Y.

Luncheon Session, 12 m.
Hotel Commodore

"The Romance and Engineering of Food Preservation," by Willis R. Woolrich, dean of engineering, The University of Texas, Austin, Texas.

Afternoon Session, 2:30 p.m.
Hotel Commodore

Dehydration of Foodstuffs

1 "Theory of Processes," by H. J. Masson, professor of chemical engineering, College of Engineering, New York University, New York, N. Y.

2 "Application of Theory to Manufacture," by Graham L. Montgomery, associate editor, *Food Industries*, New York, N. Y.

3 "Military and Civilian Practice," by Capt. Robert P. Melson, Subsistence Research Laboratories, U. S. Quartermaster Corps, Chicago, Ill.

A. L. Queneau Heads Engineering Foundation

AT the annual meeting of The Engineering Foundation, 29 West 39th Street, New York, research organization of the professional engineering Societies of civil engineering, mining and metallurgical engineering, mechanical engineering, and electrical engineering, "for the furtherance of research in science and engineering and for the advancement in any other manner of the profession of engineering and the good of mankind," held on October 15, A. L. Queneau, metallurgist United States Steel Corporation, was elected chairman for the ensuing year. Kenneth H. Condit, dean of engineering, Princeton University, was elected vice-chairman; Edwin H. Colpitts, formerly director of the Bell Telephone Laboratories, was re-elected director, and John H. R. Arms was re-elected secretary.

The executive committee is headed by Mr. Queneau as chairman. Other members are: Kenneth H. Condit, J. P. H. Perry, vice-president of the Turner Construction Company, New York; Walter I. Slichter, professor emeritus of electrical engineering, Columbia University; Charles E. Stephens, vice-president of Westinghouse Electric and Manufacturing Company; and John H. R. Arms.

Appointments to the Foundation's Research Procedure Committee include Dean Condit, chairman, E. M. T. Ryder, way engineer, Third Avenue Railway System, New York; Harold E. Wessman, professor of civil engineering at New York University; W. M. Peirce, chief of research division, New Jersey Zinc Company, Palmerton, Pa.; W. Trinks, professor of mechanical engineering, Carnegie Institute of Technology, Pittsburgh, Pa.; L. W. Chubb, director of research of the Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa.

Mr. Queneau was appointed to represent The Engineering Foundation on the Executive Board of the National Research Council.

Seventeen researches bearing on war work were endorsed by the Board for support by grants during its fiscal year 1942–1943; these include investigations in the fields of civil, mining and metallurgical, mechanical, and electrical engineering, covering various problems of soil mechanics and foundations, hydraulics, alloys of iron, critical-pressure steam boilers, fluid meters, cold-rolling steel, insulating oils and cable saturants, and welding. Professional development of the engineer also received the recognition of the Board by a grant toward the work of the E.C.P.D.

A.S.M.E. Calendar
of Coming Meetings

Nov. 30–Dec. 4, 1942
Annual Meeting
New York, N. Y.

April 26–28, 1943
Spring Meeting
Davenport, Iowa

June 14–16, 1943
Semi-Annual Meeting
Los Angeles, Calif.

(*For coming meetings of other organizations see page 36 of the advertising section of this issue*)

Cooper Union to Be Host to S.P.E.E. at New York on Dec. 5

THE regular winter meeting of the S.P.E.E. Middle Atlantic States Section will be held on Saturday, Dec. 5, 1942, at The Cooper Union, New York, N. Y.

The program will be based on recent developments concerning engineering colleges and the war effort. President Heald of the S.P.E.E., President Gano Dunn of Cooper Union, and Dean Potter of Purdue are among those who have been invited to speak. A special program for women will also be provided. Engineers in New York for the 1942 A.S.M.E. Annual Meeting are urged to attend the S.P.E.E. gathering at Cooper Union.

Meiklejohn Named Acting Chairman at Ohio State

APPOINTMENT of Prof. Robert Meiklejohn as acting chairman of the department of engineering drawing at The Ohio State University, has been announced.

Professor Meiklejohn assumes the position vacated by Prof. Thomas E. French, who on August 31 retired from active faculty duty with emeritus rank after being on the Ohio State staff continuously since 1895.

Gerard Swope Awarded Hoover Medal

To Be Presented During A.I.E.E. Winter Convention

GERARD SWOPE, president of the General Electric Company, New York, has been selected as the sixth recipient of the Hoover Medal, with the following citation:

"GERARD SWOPE, engineer and distinguished leader of industry, ever deeply interested in the welfare of his fellow men, whose constructive public service in the field of social, civic, and humanitarian effort has earned for him the Hoover Medal for 1942."

The Medal will be presented to Mr. Swope during the winter convention of the American Institute of Electrical Engineers in the week beginning January 25, 1943.

Instituted at Time of A.S.M.E. Fiftieth Anniversary

The Hoover Medal is administered by the Hoover Medal Board of Award, consisting of representatives of the American Society of Civil Engineers, American Institute of Mining and Metallurgical Engineers, The American Society of Mechanical Engineers, and the American Institute of Electrical Engineers. It was formally instituted on April 8, 1930, during the celebration of the fiftieth anniversary of The American Society of Mechanical Engineers. "To honor engineers whose pre-eminent services have advanced the well being of mankind and whose talents have been devoted to the development of a richer and more enduring civilization, the Hoover Medal is awarded in recognition and appreciation of those principles and ideals of civic obligation and of public service exemplified by the life and work of Herbert Hoover," to whom the first award was made. The second recipient was Ambrose Swasey, in 1936; John Frank Stevens was the third recipient, in 1938; Gano Dunn, the fourth recipient, in 1939, and D. Robert Yarnall, the fifth recipient in 1941.

Award Created by Past-President C. N. Lauer

Mr. Conrad N. Lauer, Fellow of the A.S.M.E., and chairman of the Board of the Philadelphia Gas Works, created the award in 1929 with the gift of a trust fund which is held by The American Society of Mechanical Engineers.

Gerard Swope was born in St. Louis, Mo., December 1, 1872. He graduated from Massachusetts Institute of Technology in 1895 with a B.S. in electrical engineering. His first job after graduation was in the Chicago shops of Western Electric Co. By 1913 he had advanced to a position as director and vice-president in charge of Western Electric's commercial work in this country and of all its operations abroad.

During World War I he served on the Army General Staff as Assistant Director of Purchase, Storage, and Traffic. For his work he was awarded the Distinguished Service Medal; and he also was made a Chevalier of the French Legion of Honor.

In 1919, when General Electric Company organized the International General Electric Company to handle its foreign business, Mr. Swope was made president of the new organization.

Three years later, on May 16, 1922, he was elected president of General Electric Company, the largest electrical manufacturing company in the world.

In April, 1927, he was named chairman of the board of the IGE Co.

On January 1, 1940, he resigned as president of the General Electric Company, but continued as a director of the company and as chairman of IGE.

During the succeeding 2½ years he was chairman of the N. Y. City Housing Authority; then Assistant to Secretary of the Treasury, Morgenthau.

He was elected president of the General Electric Company for the second time on September 18, 1942, when his successor, Charles E. Wilson, was named vice-chairman of the W.P.B.

Re-Elected President of Engineering Group

ALBERT ROBERTS, mining engineer of Summit, New Jersey, and secretary of Minerals Separation North America Corporation, New York, N. Y., has been re-elected president of United Engineering Trustees, Inc., the joint agency of the four national engineering societies, Civil, Mining and Metallurgical, Mechanical, and Electrical. He is active in the affairs of the American Institute of Mining and Metallurgical Engineers, is one of the representatives of the Institute on the Board of United Engineering Trustees, Inc.

Others elected were vice-president F. Malcolm Farmer, vice-president of Electrical Testing Laboratories; vice-president and treasurer, Arthur S. Tuttle, consulting engineer; assistant treasurer, W. D. B. Motter, Jr., assistant to the vice-president of the Chile Exploration Company; and John H. R. Arms, re-elected secretary.

United Engineering Trustees, incorporated in 1904, administers the Engineering Societies Building, Engineering Societies Library, and endowment funds for The Engineering Foundation (research organization acting for the engineering societies) as departments of United Engineering Trustees, Inc. The Corporation was established in 1904 to "advance the engineering arts and sciences in all their branches, to further research in science and engineering, and to maintain a free public engineering library."

1942 List of American Standards

THE American Standards Association recently announced the publication of its newest List of American Standards for 1942.

More than 550 American Standards are listed, of which 71 represent new and revised standards approved since the last (February, 1942) issue of the list.

There is a separate heading for American War Standards—standards developed specifically for the war effort.

Another section is devoted to American Safety Standards, which are also of great importance to the war effort in connection with the President's program for the conservation of man power.

Other standards include definitions of technical terms, specifications for metals and other materials, methods of test for the finished product, dimensions, etc. They reach into every important engineering field and serve as a basis for many municipal, state, and Federal regulations.

Standards have assumed a vital role today in connection with the war effort. Every Government order is based on specifications, and standards are further used in industry in simplifying the production problem, conserving materials, pegging quality to price control, in inspection, and in contracting and subcontracting. A large part of A.S.A.'s work is now on wartime jobs which have been requested by Army, Navy, W.P.B., O.P.A., and industry.

In each case, the standards approved by the A.S.A. represent general agreement on the part of maker, seller, and user groups as to the best current industrial practice. More than 600 organizations are taking part in this work.

This List of American Standards for 1942 will be sent free of charge to anyone writing in for it. Requests should be addressed to the American Standards Association, 29 West 39th Street, New York, N. Y.

Used Steam Boilers Needed by U. S. Army

AN urgent appeal for used steam boilers—5700 are said to be needed by April 30, 1943, by one branch of the Army alone—has been received from the Conservation Division of the War Production Board.

All types of used boilers in sizes from 35 hp up and with operating pressures from 15 psi are needed. Information concerning available used steam boilers should be sent to J. B. Joyner, Surplus Used Equipment Section, Conservation Division, War Production Board, 1100 H Street, Washington, D. C., and should include horsepower and operating pressure of the boiler, general description of the equipment, present location, name of person who can arrange for any inspection deemed necessary.

Aeronautical Engineering Department Set Up at U. of Texas

THE University of Texas has recently announced the appointment of Dr. M. J. Thompson, member A.S.M.E., as chairman of its newly created department of aeronautical engineering. This work in the aeronautical field is an outgrowth of courses started in 1926 and previously offered in the department of mechanical engineering. Plans are now well developed for the offering of a bachelor's and graduate degrees in aeronautical engineering. With an accelerated program which involves attendance through the summer months, the

work for the bachelor's degree can be completed in approximately three years.

An extensive program of engineering, science, and management war-training courses is also being carried on in the aircraft field with courses available in Austin, Fort Worth, Dallas, Houston, and other points throughout the state. At present nearly forty part-time classes and one full-time course in aeronautical engineering are in progress with nearly a thousand men and women receiving training in this critical field.

The University plans to rapidly expand both its instructional and research work in the aeronautical field to meet the tremendous demands for trained technical personnel, particularly in the Southwest. At present all efforts are being concentrated on the training requirements of the war program with instruction being made available to both men and women.

Electrochemical Society Organizes Corrosion Division

ON October 9, 1942, at the Fall Convention in Detroit, the Corrosion Division of The Electrochemical Society was organized. At this meeting the By-Laws were adopted and the following officers were elected:

Chairman: L. G. Vande Bogart, research and development laboratories, Crane Company, Chicago, Ill.

Vice-chairman: H. H. Uhlig, General Electric Co., research laboratory, Schenectady, N. Y.

Secretary-Treasurer: R. H. Brown, metallurgical division, aluminum research laboratories, Aluminum Company of America, New Kensington, Pa.

The Corrosion Division was organized because of the interest displayed by a large number of the members of The Electrochemical Society in this phase of the work. The object of the division is to co-ordinate the interests of the Society relating to corrosion, with individuals and organizations which are particularly interested and active in this field, to solicit papers and plan symposia. Members of the Society interested in corrosion are eligible for membership in the Corrosion Division. Persons who are not members, but are particularly interested in corrosion work, are invited to join The Electrochemical Society and participate in the work of the Corrosion Division.

A.S.T.M. Standards on Petroleum Products and Lubricants

THE 1942 (October) edition of "A.S.T.M. Standards on Petroleum Products and Lubricants" includes some 87 standard tests. In addition there are several proposed tests not yet adopted by the committee covering the following: Oil content of paraffin wax, color of lubricating oil by means of photoelectric colorimeter, potential gum in aviation gasoline, and oxidation characteristics of heavy-duty crankcase oils. New standards given in the volume for the first time cover tests for neutralization number of petroleum products by color-indicator titration and by electrometric titration, test for rust-preventing characteristics of steam-turbine oil in the presence of water, conversion of kinematic viscosity to Saybolt Furol viscosity, and a test for sludge formation in mineral transformer oil.

Included among the widely used standard tests for petroleum products are the following: Acid heat (gasoline), aniline point, burning quality (kerosene, long-time burning, and mineral seal oil), carbon residue, cloud and pour points, consistency (greases and petrolatum), ductility (bituminous materials), flash points by open cup, Pensky-Martens and Tag closed tester, gum content (gasoline), and knock characteristics (motor and aviation fuels).

Also the following: Oxidation stability (gasoline), precipitation number, saponification number, sediment (fuel oil), tetraethyl lead (gasoline), thermal value (fuel oil), vapor pressure (motor, aviation, and natural gasoline), and water and sediment.

Copies of this 450-page publication can be obtained in heavy paper cover from A.S.T.M. Headquarters, 260 S. Broad St., Philadelphia, Pa.

Caterpillar Shopmen Form Engineers' Company

CATERPILLAR Tractor Co., Peoria, Ill., announces that it has sponsored a Corps of Engineers Heavy Shop Company, composed chiefly of skilled "Caterpillar" men from the Peoria plant, and that the Shop Company is now in training for active service.

In command of the Shop Company is Captain Jean Walker, formerly export representative for Caterpillar.

Caterpillar was the first equipment manufacturer to respond to the call of the engineers for an organization composed of skilled man power to keep the machinery of the engineers rolling. The Company consists of 199 officers and men, most of whom will become non-commissioned officers or technicians.

Technical Consultants to Rubber Director Jeffers Are Named

APPOINTMENT of a staff of technical consultants on the nation's rubber program was announced today by Rubber Director Willaim M. Jeffers. They will serve under Col. Bradley Dewey, deputy director, upon whom Mr. Jeffers has placed responsibility for the technical aspects of the program.

Those named are:

E. B. BABCOCK, Akron, Ohio, is chief chemist for the Firestone Tire and Rubber Company. Mr. Babcock has been active in the development of synthetic rubber for a number of years and is thoroughly familiar with European developments as well as those in this country. He has made a personal study of crude-rubber development in Central and South America and Africa, and of guayule in the United States and Mexico.

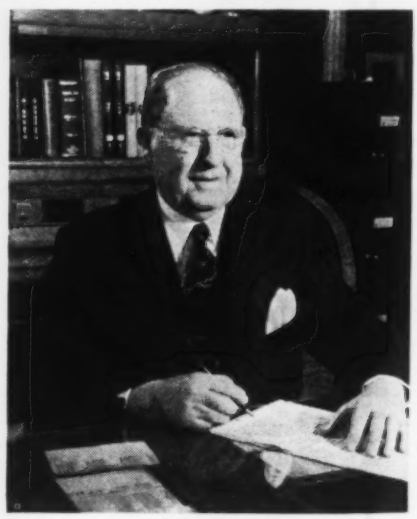
L. D. TOMPKINS, Wilton, Conn., is vice-president of the U. S. Rubber Company. He formerly was in charge of the development, production, and sale of tires for his company and was active in the development of U. S. Rubber's Far Eastern plantations. Mr. Tompkins was an assistant to the late Gen. Hugh S. Johnson in N.R.A. and to Gen. W. S. Knudsen in O.P.M.

DR. E. R. GILLILAND, Cambridge, Mass., is professor of chemical engineering at Massachusetts Institute of Technology. He is co-author of the standard textbook on chemical engineering and has done considerable consulting work on petroleum technology, specializing in problems of refinery conversion and purification of raw materials for the manufacture of synthetics.

W. L. CAMPBELL, New York, N. Y., formerly was vice-president of Kroger Grocery Company in charge of manufacturing and plants. He has been actively engaged in war work, as vice-president of the American Machine Defense Corporation and as consultant to the Army Quartermaster Corps.

MOREHEAD PATTERSON, New York, N. Y., is president of the American Machine and Foundry Company. In addition to wide experience in organizational problems, Mr. Patterson is thoroughly conversant with the production and use of high-speed machinery.

RAY P. DINSMORE, Akron, Ohio, is manager of development for Goodyear Tire & Rubber Company. He is in charge of all research for the company, in both crude and synthetic rubber, and for several years before the war was in close touch with German synthetic-rubber development. Mr. Dinsmore is the author of numerous scientific papers on synthetic rubber.



WILLIAM MONROE WHITE

(William Monroe White, member A.S.M.E., whose retirement as manager of the hydraulic-turbine department, Allis-Chalmers Mfg. Company, was announced in October. Dr. White has served on A.S.M.E. Power Test Code Committees and has contributed papers on hydraulic turbines to A.S.M.E. publications.)

Among the Local Sections

Akron-Canton Section Hears Talk on Induction Hardening

THE October 8 meeting of Akron-Canton Section featured Dr. H. B. Osborn, Jr., who spoke on "The Tocco Process of Electrical Induction Hardening." He stressed design of equipment, handling, and adaptability to the production line. Many examples were given, showing the great improvements made possible by this process and the consequent savings resulting from its use. This interesting talk was illustrated with slides and followed by open discussion.

Anthracite-Lehigh Valley Features Scrap Discussion

Members of Anthracite-Lehigh Valley Section heard two timely topics discussed at their Oct. 30 meeting. The first, "The Process of Collecting Scrap Materials," was presented by Thomas L. Hinkle, superintendent of Hazleton, Pa., schools, who has evolved a community project which makes possible the collection of scrap through the schools by means of a co-operative plan. The second talk by Dr. D. R. Kellogg, assistant manager of Westinghouse Engineering Laboratories, discussed "Use of Substitute and Alternate Materials in Today's Production." He treated, among other materials, the substitution of silver for nickel, steel for brass, and pressed wood for steel.

Atlanta Engineers Numbering 100 Hear About Streamlining

Prof. Roscoe Morton, University of Tennessee, was the guest speaker at the Oct. 26 meeting of the Atlanta Section. He showed slides of streamlined Diesel trains to give the audience an idea about the type of equipment utilized. Comparative costs of operating streamlined and conventional steam-locomotive trains were presented.

Production of Large Shells Topic at Birmingham Meeting

Birmingham Section at its Oct. 26 meeting starred W. N. Howley, president of Lansdowne Steel Co., who spoke on "The Production of Large Shells." This was a joint meeting held with the Birmingham Engineers' Club, American Society for Metals, and American Iron and Steel Engineers.

Cyclone Engine Main Item of Bridgeport Meeting

More than 60 members and guests, at the Oct. 22 meeting of Bridgeport Section, heard H. E. Linsley, Wright Aeronautical Corp., talk on "Cyclone Combustion." The speaker opened the meeting with a short talk followed by a two-reel film on aviation, detailing the making of a cyclone engine and the march of time in aviation advancement up to the present day. The speaker proved unusually stimulating, possessed as he was with an abundance of information on aircraft so absorbing to the Sikorsky men present.

ERNEST HARTFORD, EXECUTIVE ASSISTANT SECRETARY OF THE A.S.M.E. AND O. L. ANGEVINE, GENERAL SECRETARY FOR THE A.S.M.E. ROCHESTER FALL MEETING, SECRETARY OF THE ROCHESTER ENGINEERING SOCIETY

AT THE A.S.M.E. FALL MEETING IN ROCHESTER, N. Y., OCTOBER 12–14

(Sern Madsen, mechanical engineer with the Mattison Machine Works, Rockford, Ill., who acted as chairman of the first Wood Industries Session, and who is to be new chairman of the A.S.M.E. Production Engineering Division, and Edwin N. Trump, past vice-president of the A.S.M.E., senior member of the firm of E. N. and C. C. Trump, Syracuse, N. Y., and the only living charter member of the A.S.M.E.)

Central Pennsylvania Section Flies into the Future

"Civilian Flying in the Future" was the prophetic topic at the Oct. 8 meeting of the Central Pennsylvania Section at which more than 85 members and guests were present. W. T. Piper, president of Piper Aircraft Corp., reviewed the past progress of the aircraft industry and indicated the obstacles and restrictions that must be overcome to permit general civilian flying. His talk was concluded with a comparison of the growth of the automotive industry and its final indispensability.

Activity Characterizes Month of October for Chicago

Following the Oct. 1 smoker, which proved so successful, Chicago members attended several other meetings during the month. The Oct. 26 meeting was highlighted by a talk on "Mechanical Engineering Applications of Cement and Cement Products" by Dr. F. O. Anderson. Prestressed concrete and its applications, design of beams now used in prefabricated houses, and the possibility of replacing large masses of steel in machine beds were considered. The lesson in the talk was the definite opportunity to save metals and money through use of concrete in construction of homes and industrial plants.

Get-Together Held by Columbus Members

The purpose of the Oct. 23 meeting of Columbus Section was to give members and guests a better chance to become acquainted with one another. The smoker, held at Battelle Memorial Institute, featured movies of the 1942 Ohio State - Indiana football game. James Hull, of the Ohio State coaching staff, acted as narrator. Friendly discussion among the members themselves followed the showing of the film.

Detroit Section Holds Traditional Meeting

Carrying on a custom of many years' standing, Detroit Section held a joint meeting with the Border Cities Branch of the Engineering Institute of Canada at Windsor, Ontario, on Oct. 16. This meeting was made especially outstanding by the fine spirit of hospitality extended by the members of E.I.C. and the excellent program arranged. Honored guests at the meeting were Dean C. R. Young, president of the E.I.C., and Dr. J. W. Parker, president of the A.S.M.E. Following a toast of welcome by C. M. Goodrich, in behalf of E.I.C., and response by Dr. Parker, J. Armour, chairman of the Detroit Section, offered a toast to the E.I.C. and the speaker of the evening, Dean Young. The latter spoke on "The Engineer and the Technologist." He defined and discussed the fields of the technician, the technologist, and the engineer, emphasizing the obligations of the engineer in completing the work required for victory.

"The point of view of the real engineer, who is essentially a co-ordinator of all the arts and sciences in the achievement of wholesome enterprises, is of vaster importance than the limited narrowly channeled viewpoint of the pure technologist," declared Dean Young. He charged the engineers to remember that human society is complex, filled with loves, hates, discords, and clashes of all kinds. "No man can hope to solve mankind's problems, scientific or otherwise," he stated, "without taking all these things into consideration."

At the Oct. 20 meeting, members heard Charles Gadd, General Motors research laboratories, present a paper, illustrated by colored slides on "Application of Strain Measurements to Design Problems." The speaker exhibited a dynamic type of strain gage which is glued to the part to be tested, and in which the electrical resistance varies with the strain. Applications of these techniques outside the field of design were mentioned in maintenance and operation.

AT THE PANEL DISCUSSION ON EDUCATION FOR INDUSTRY—A SESSION AT THE A.S.M.E. FALL MEETING IN ROCHESTER, OCTOBER 12–14

(*Left to right:* Carl L. Bausch, chairman of the session, Fellow A.S.M.E., vice-president, Bausch & Lomb Optical Co., Rochester, N. Y.; Mark Ellingson, president, Rochester Athenaeum & Mechanics Institute, Rochester, N. Y.; Verne Bird, assistant superintendent in charge of vocational education, Rochester Public Schools, Rochester, N. Y.; S. C. Hollister, Mem. A.S.M.E., dean, College of Engineering, Cornell University, Ithaca, N. Y.; Ralph C. Welch, chairman, Training Committee of the Industrial Management Council; employment manager, camera works, Eastman Kodak Co., Rochester, N. Y.; L. J. Fletcher, Mem. A.S.M.E., director of training, Caterpillar Tractor Co., Peoria, Ill.; R. L. Goetzenberger, Mem. A.S.M.E., vice-president, Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.; M. J. Kane, Training Within Industry, W.P.B., Washington, D. C.; Emile J. Pelletier, Mem. A.S.M.E., Bell Aircraft Corporation, Buffalo, N. Y.)

AT THE WEDNESDAY LUNCHEON OF THE A.S.M.E. FALL MEETING AT ROCHESTER, N. Y., OCTOBER 12–14

(*Left to right*: George A. Stetson, Editor, A.S.M.E. Publications, W. H. Hutchins, works manager, Delco Appliance Division, General Motors Corporation, Rochester, N. Y., and Edwin A. Fisher, city engineer, emeritus, of Rochester and the first president of the Rochester Engineering Society.)

East Tennessee Holds Joint Meeting With A.I.E.E.

"Electrothermal Processes" was the topic at the Oct. 21 meeting of East Tennessee Section and the local chapter of the A.I.E.E. The speaker, N. R. Stansel, General Electric Co., spoke capably on his subject to more than 56 members and guests.

Navy Cadet Requirements Stressed at Hartford

To an interested audience, Professor Perkins and J. Murphy spoke on "Aviation Cadet Procurement" at the Oct. 26 meeting, attended by more than 50 members. The talks embodied varied types of training required of all naval cadets, so timely a subject now.

Kansas City Hears About Engineering Defense Training

Dean R. A. Seaton, Kansas State College, told the members of Kansas City Section on Oct. 23, about the history and present status of the engineering defense-training program. As past-director of this program, he was able to give firsthand information regarding the problems and accomplishments of this organization.

Mid-Continent Section Honors Past-Chairman Porter

Mid-Continent Section at its Oct. 5 meeting honored Hollis P. Porter, the first chairman of

the Section, who is leaving for Arizona on account of his health. Dean Foster, also one of the first members of the organization, gave a short talk recalling old memories and presented Mr. Porter with a billfold suitably marked with the letters A.S.M.E. as a token of remembrance.

Milwaukee Engineers Hear About Super-Rubber Tire

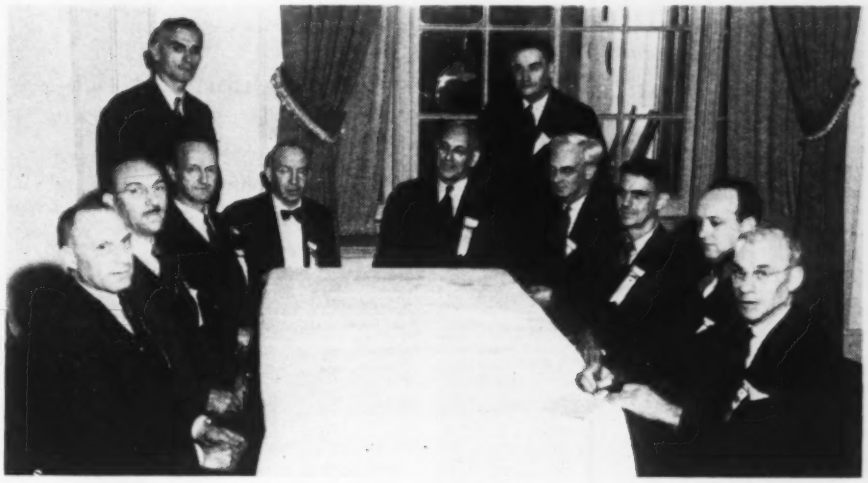
More than 150 members and guests were present at the Oct. 21 meeting of the Milwaukee Section when F. M. Andrews, Hycar Chemical Co., told of new processes developed in the synthetic-rubber industry that may serve to alleviate the natural-rubber shortage for the nation. Tires, according to Mr. Andrews, can be made of 100 per cent synthetic rubber, and will stand up as well or better than the natural-rubber tires now in use. He stated, "In certain applications, this new tire runs cooler at speeds above 50 mph, and will not wear as rapidly as tires now made of natural rubber."

New Orleans Members View Motion Picture on Steel

At the Oct. 30 session of the New Orleans Section, members saw the U. S. Steel Corp. colored motion picture on the manufacture of steel. Everyone enjoyed the film.

Prefabricated Ships Subject at Ontario

G. C. Arnold, at the Oct. 8 meeting of the Ontario Section, discussed the construction methods employed in the Canadian shipyards, and also the extent to which prefabrication was being utilized at the present time.



COMMITTEE ON ARRANGEMENTS FOR THE A.S.M.E. FALL MEETING IN ROCHESTER, N. Y. OCTOBER 12–14

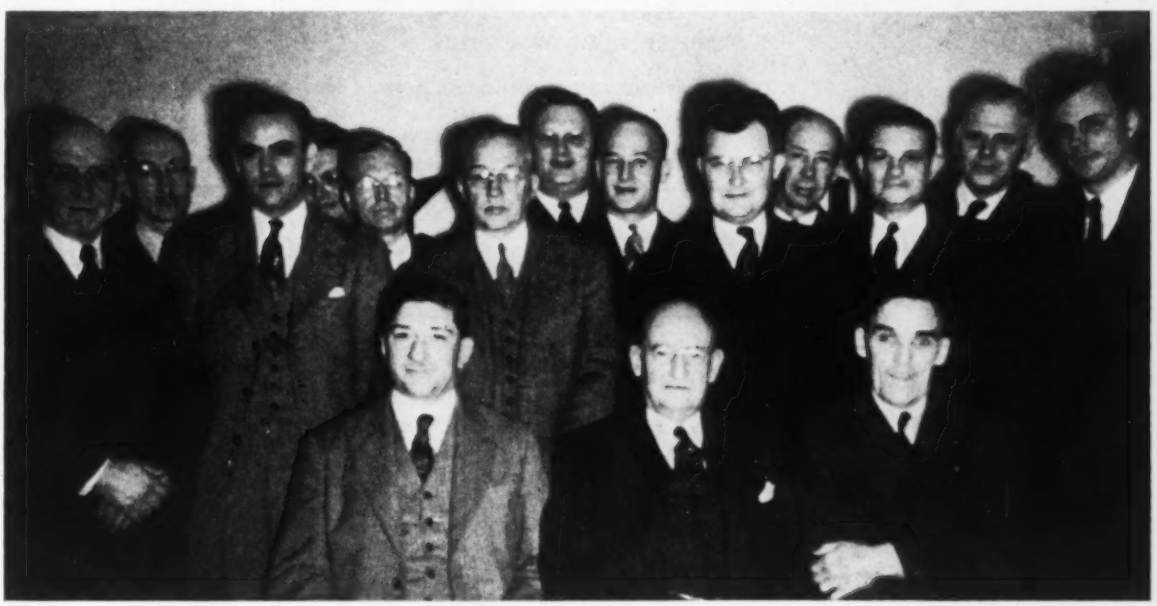
(*Seated, left to right:* S. S. Stacey, A. W. Schuster, C.C. Ross, A. H. Candee, V. M. Palmer, general chairman of the Fall Meeting, Howard Harding, T. F. Hooker, W. D. Wood, and A. E. Schell. *Standing, left to right:* I. G. McChesney and O. L. Angevine, general secretary of the Fall Meeting and secretary of the Rochester Engineering Society.)

More Than 200 Attend Philadelphia Session

An audience of more than 200 engineers was present at the Oct. 27 meeting held by the Philadelphia Section at which the guest speaker was Dr. Howard I. Cramer. In his talk he told of the small amount of crude rubber available to the United Nations, the disadvantages of reclaimed rubber as a substitute, and the development of synthetic rubber from Faraday's empirical formula of 1826 to the present proposed production of thousands of tons annually.

War-Time Requirements for Textiles Explained to Providence Members

"Meeting War Time Requirements for Textiles" was the subject of the paper presented by



GROUP VI CONFERENCE OF LOCAL SECTIONS DELEGATES AT ST. LOUIS, STATLER HOTEL, OCTOBER 31

(*Seated, left to right:* Ernest Hartford, executive assistant secretary, A.S.M.E.; Harold V. Coes, president-elect, A.S.M.E., Prof. Ben G. Elliott, University of Wisconsin, chairman. *Standing, left to right:* W. H. Erskine, St. Paul, Minn.; J. A. Keeth, Kansas City, Kan., Local Sections' Committee representative; G. L. Folwer, Central Indiana; F. P. Shannon, Louisville, Ky.; Linn Helander, member of A.S.M.E. Council, Manhattan, Kan.; C. C. Austin, Chicago, Ill.; J. K. Ludwickson, Nebraska; E. L. Dahlund, Rock River Valley, Beloit, Wis.; K. R. Hodges, Tri-Cities, Davenport, Ia.; L. H. Stark, Milwaukee, Wis.; R. C. Thumsey, St. Louis, Mo.; F. L. Ruoff, Fort Wayne, Ind.; B. E. McClain, Central Illinois, Peoria, Ill.)

Prof. E. R. Schwarz, of M.I.T., on Oct. 6 before the Providence Section. He described tests for determining quality of parachute fabrics, shroud lines, blankets, yarns, and fibers, and illustrated his points with numerous lantern slides and specimens of yarns and fabrics. Various types of testing equipment were illustrated and curves and formulas explained in making comparison tests.

Rock River Valley Section Holds Dinner and Social Meeting

The Sept. 24 meeting of the Rock River Valley Section was a semisocial affair. After dinner, a little time was devoted to a discussion of the agenda for the 1942 Local Sections Conference. Following this the film, "Mines Above Ground" was shown. Then a talk on football was given by one of the coaches of the football team from the University of Wisconsin.

President Parker Honored Guest at San Francisco

James W. Parker, president of the A.S.M.E., was welcomed to San Francisco at a dinner-meeting held on Oct. 30 by the San Francisco Section. Following the dinner, President Parker gave a talk on the historic developments leading to this war and analyzed the obligations of mechanical engineers as to the role they will have to play in furthering our war effort as well as in the period following our struggle for survival of democratic principles.

Fighting Aircraft at St. Joseph Valley

More than 400 engineers and friends were guests of the St. Joseph Valley Section at the Oct. 20 meeting. The program consisted of several reels of motion pictures which covered the manufacturing methods in making the Bell *Airacobra*, the manufacture of the Wright aircraft engine, the principle of ignition in the combustion chamber, and the topic, "America First in the Air."

More than 300 members and guests were present at the Oct. 28 meeting which featured a paper, "Generation, Application, and Distribution of Electric Power," given by Philip Sporn, vice-president, American Gas and Electric Co. In conjunction with lantern slides, the speaker covered the latest developments in equipment, economies effected, and a comparison of costs of shipping coal with the costs of transmitting electric energy by power lines.

St. Louis Learns About Plastics in Industry

St. Louis Section presented as speaker, Erik Furholmen, Chicago Molded Products Corp., at the Oct. 23 meeting. His subject, "Plastics in War Industry," proved very interesting to the audience. He stated that plastics had made a real contribution to the war effort by releasing vitally needed metals. Also described were several methods of preparing plastic products, and interesting applications were shown and discussed.

Southern California Welcomes A.S.M.E. President Parker

Members came from near and far on Nov. 2 to the Southern California Section meeting in order to see and hear James W. Parker, president of the A.S.M.E. Following his very stirring address, "A New Engineering Phase," President Parker presented 50-Year A.S.M.E. buttons to Charles V. Kerr and Andrew Pinkerton.

On Oct. 16, more than 100 members and guests were treated to two excellent papers. The first, "The Future of Gliding," by Wm. H. Bowlus, president of Airborne Transport, Inc., traced the present use of gliders for airborne troops to future use as freight and passenger carriers. The second, "The Mechanical Properties of Plastics," covered recent plastic applications in aircraft and national-defense industries. Factors, such as temperatures and humidity, and their influences upon the physical properties were outlined and discussed.

Halloween Smoker Initiates Susquehanna Section Season

The time, Oct. 27; the scene, Violet Hill Cafe; and the occasion, the inaugural meeting of the Susquehanna Section; helped to furnish a Halloween treat to many A.S.M.E. members in and about York, Pa. Following the last dinner course, James Scoville elucidated on the subject of "Hydraulics and Hydraulic Machinery," while those present enjoyed their cigars, cigarettes, and pipes.

Utah Section Told About Army Use of Machines

Problems encountered in constructing Army camps and air bases, and the use of mechanical equipment to expedite the work were some of the topics discussed at the Oct. 19 meeting of Utah Section by Major M. C. Gould. Much difficulty is being experienced now, stated the Major, in obtaining materials as specified in the contracts.

Engineer Important in Warfare Washington, D. C. Members Hear

In a talk presented before 150 members and guests of the Washington, D. C., Section on Oct. 8, Lieut. Col. Paul W. Thompson, U. S. Army, stated that the engineer's duty in modern warfare is twofold, namely, to decrease the mobility of the enemy and to increase the mobility of his own forces. These duties are accomplished by erecting obstacles in the path of the enemy and removing obstacles from the path of his own forces.

Locomotives Subject of West Virginia Section Meeting

"Steam, Electric, and Diesel Locomotives and their Welding Problems" was the subject of an address made before the West Virginia Section on Oct. 27 by James Partington, American Locomotive Co. Following Mr. Partington's talk, the motion picture "Railroadin'," a story of America's railroads in sound and color, was shown.

85 Members and Guests Attend Western Massachusetts Session

Western Massachusetts Section held its regular monthly dinner-meeting on Oct. 20, with 85 members and guests present. Speaker of the evening was Prof. Charles M. Spofford, who spoke on "The Civilian Engineer in War Activities and Postwar Planning." He covered in detail the many problems and their solutions in connection with the construction of shipyards and drydocks.

With the Student Branches

U. S. Marine Officer Addresses Arizona

ESPECIALLY interesting to those planning to join the U. S. Marine Corps was the talk given before the members of ARIZONA BRANCH on Oct. 21 by Lieutenant John Sivers of the Marines. He described the life and training of the "leathernecks." Since the beginning of the semester, 26 members have signed up.

AKRON BRANCH at the meeting of Oct. 22 presented Allan Buckley, former chief engineer of the Goodyear Rubber Company's Java plant. High lights of his talk included a description of the engineering details of the plant, a discussion of the military situation in the Philippines at the time of the Japanese attack, and an outline of conditions in Hawaii, Japan, China, and the Orient.

BROOKLYN POLY BRANCH held the first meeting of the semester on Oct. 9 and elected officers to run the Branch. The meeting was concluded with a talk on the advantages of A.S.M.E. membership by Professor Kniffen, honorary chairman.

CALIFORNIA TECH BRANCH held a general meeting on Oct. 16 for the purpose of renewing old memberships and securing new additions. Herbert Lassen, chairman, summarized the activities of the past year and outlined plans for the coming year. Bids to the engineers' dance to be held Oct. 24 under the joint sponsorship of the A.S.M.E., A.S.C.E., and A.I.E.E. were sold.

CLARKSON BRANCH met on Oct. 15 for the first meeting of the term. With 40 members and guests present, Gerald Zecher, chairman,

SENIOR CLASS OF MECHANICAL ENGINEERS AT ILLINOIS INSTITUTE OF TECHNOLOGY

discussed the advantages of A.S.M.E. membership, and such points as publications, business contacts, inspection trips, and the annual student regional conference.

Colorado State Hears Student Member

Harold Copeland, student member, was the speaker at the Oct. 5 session of COLORADO STATE COLLEGE BRANCH. He related his experiences at the Westinghouse Electric and Manufacturing Co., where he was employed during the past summer. The paper was enjoyed by all those attending. On Oct. 19, the members viewed the motion picture, "Coal Is King," which showed the value of coal in the world today and stressed cleanliness and efficiency in the boiler room.

COOPER UNION BRANCH on Sept. 28 welcomed John Van Brunt, vice-president in charge of engineering, Combustion Engineering Co., who discussed the design of high-pressure boilers, starting from the preliminary specifications received through design to the finished product.

Cornell Inspects Eastman Kodak

In conjunction with the Fall Meeting of the A.S.M.E. in Rochester, CORNELL BRANCH members on Oct. 14 visited the refrigeration and power plants of the Eastman Kodak Co., as well as some of the buildings in which photographic film was made and packaged.

FLORIDA BRANCH met during October on the 9th and 23rd. Papers were given by several members, one on the advantages of membership, two on the summer activities of the speakers, one on the operations of Pan American Airways at Miami, and one on the process of making seamless steel sheets into seamless bombs.

ILLINOIS TECH BRANCH, despite the accelerated program of instruction for engineers during the summer, enjoyed a very active program. The summer session opened with a very successful membership drive led by John Duckrow. Because of the war work engaged in by industrial firms in the Chicago vicinity, the student members were unable to go on any inspection trips. The lack of inspection trips was compensated by an abundance of interesting and educational motion pictures and speakers at the weekly meetings. On Aug. 25 all mechanical-engineering students were guests of the Branch at an outing held at the Indian Wood Country Club. Sports included golf, baseball, horseshoes, and swimming.

Student Papers Feature Iowa Meetings

During the months of September and October, very interesting papers were presented before the IOWA BRANCH by student members. J. F. Seitz talked on the technical details of American warplanes. Bruce Multhaup gave an account of the activities of engineering societies, George Larsen discussed the size and performance of present-day warplanes, Robert Parder told of the conversion of the Warner Swasey plant to war work, and Sam Edelman spoke about the camouflaging of factory areas.

IOWA STATE COLLEGE BRANCH opened the semester with a meeting on Oct. 1 which was attended by more than 100 members and guests. Phillip Goddard, chairman, introduced Prof. David L. Arm, head of the department of mechanical engineering, who made a brief talk and introduced the six new members of the department. Prof. R. W. Breckenridge, honorary chairman, then conducted the "peace-pipe" ceremony. This year a mechanical man, "Meisc," smoked the pipe as proxy for the members, thus preventing any spread of the already serious epidemic of colds.

KANSAS BRANCH initiated its program for the new semester with a meeting on Oct. 8 attended by more than 50. The honorary chairman, Prof. E. E. Ambrosius, stressed the advantages of membership and closed by offering to pay the cost of refreshments at one of the regular meetings if the A.S.M.E. membership exceeded 60 per cent of the enrolled students eligible for membership.

Importance of Mathematics at Kentucky

The meeting of Oct. 16 held by KENTUCKY BRANCH had as guest speaker, Dr. H. H. Downing, of the mathematics department. Using as his subject, "The Relation of Mathematics to the Present-Day Situation," Dr. Downing discussed his work in the preparation of an arithmetic book for army men, understandable to a man of fourth-grade intelligence, and emphasized the appallingly large amount of illiteracy in this country and the lack of mathematics requirements in most schools. He closed his talk by giving some common and amusing mathematical errors.

MARYLAND BRANCH met for the last meeting of the summer semester on Sept. 9 at which the speaker was Raymond Dietz, student member. He told of an unique type of tailless aircraft built by Chester Eshelman.

MICHIGAN BRANCH members numbering 75 were present at the Oct. 14 session to hear talks by Professors Porter, Hawley, and Schwartz. "Diesel—The Modern Power," a motion picture, was shown and the meeting adjourned after refreshments were served.

MICHIGAN STATE COLLEGE BRANCH entertained its members on Oct. 6 with the demonstration of a novel cigarette lighter, designed in Rube Goldberg fashion and described by Preston Liebig. The program for Oct. 20 consisted of papers by student members, who included Albert Smith, Bruce Simpson, August Sunnen, Richard Ferriss, and William Broker.

Mississippi State Passes Out Cigars

Cigars were passed out at the door as members and guests arrived for the Oct. 13 meeting of MISSISSIPPI STATE BRANCH. E. W. Pettis, chairman, discussed the advantages of belonging to the A.S.M.E. An outing, probably a steak supper, was suggested. The program committee announced that at the next meeting to be held on Oct. 27, a motion picture, "Keep 'Em Rolling," would be shown.

MISSOURI BRANCH members were guests of the

faculty at a picnic held on Oct. 17 at Rollins Spring. Needless to say, everyone enjoyed himself.

MISSOURI MINES BRANCH members heard an interesting talk on Oct. 19 given by Stanley Orlofsky, student member, on his experiences this past summer as a steamfitter in the Texas shipyard of the Consolidated Steel Co. Following the talk, plans were completed for the participation of the Branch in the Parents' Day program on Oct. 24. Several members volunteered to prepare an exhibit on aeronautical engineering, while others agreed to demonstrate the operation of the machinery used in the school's power plant, forge shop, welding shop, and machine shop. Plans were also made to prepare exhibits of such mechanical devices as gears, valves, etc., and working models of steam and gas engines.

NEBRASKA BRANCH started its annual membership drive with the meeting of Oct. 6. On Oct. 7, the student members were guests of the Omaha Engineers' Club at luncheon and concluded the day with an inspection of Omaha industrial plants, including the new sewage-disposal plant and the Union Pacific Railroad exhibit.

N.Y.U. Branch Publishes Newsheet

At the smoker of the N.Y.U. BRANCH held on Oct. 22, the initial issue of the Branch's publication, "*The Streamline*," was distributed. The editor is Robert Avigdor, secretary of the Branch. Speaker at the meeting was Major Carlos DeZafra, Ord. Res., who spoke on "Shipbuilding Methods," illustrating his talk with charts and diagrams.

N.Y.U. BRANCH (evening division) exhibited on Oct. 28 a motion picture showing the manufacture and processing of steel from the iron ore to the finished article. Particularly interesting to the 40 members and guests present were the methods of manufacturing rods, bar shapes, and other shapes.

NORTHEASTERN BRANCH featured talks by professors at its meetings during September and October. Professor Pinard, of the sociology department, spoke on "India," based on his personal experiences. "The History of the Steam Engine," was presented by Professor Ferretti, of the mechanical-engineering department. A paper, "The University in Connection With the War," was given by Professor Hamilton, of the economics department.

Bombing Raid at Ohio State

The program for the Oct. 16 meeting of OHIO STATE BRANCH was a film, "Target for Tonight," which described how a bombing raid was planned from reconnaissance photographs and carried out. On Oct. 9 Dr. Obertueffer, member of the faculty, presented "War and Education," a discourse on how the accelerated war program affects the health of engineering students.

OKLAHOMA BRANCH served ice cream and doughnuts to start the meeting of Oct. 15. Advantages of membership in the A.S.M.E. were discussed by Prof. E. M. Sims. This was followed with the showing of two films, "The Battle of Midway," and "Yosemite National Park."

OKLAHOMA A.&M. BRANCH members and guests numbering 93 were present at the smoker held on Sept. 28. Following games and entertainment by some of the students, the group was addressed by Prof. C. M. Leonard, honorary chairman, and Prof. E. C. Baker, chairman of the Mid-Continent Section of the A.S.M.E.

PRATT BRANCH held its third meeting of the semester on Oct. 21, at which a film, "From Mine to Consumer," was shown. The story was presented in color and told about the mining, refining, and manufacturing of copper and brass.

PURDUE BRANCH featured as guest speaker at the Oct. 7 session Dr. E. P. Miller, of the physics department, who discussed the use of X-rays in industry. Some of the uses of the rays include the indication of defects in materials, damaged tinned food, crystallography, and machinery. The speaker at the Oct. 28 meeting was Dr. John Rutledge, whose topic was "Soil Mechanics."

R.P.I. Has Interesting Papers

The speaker on Sept. 22 before RENSSELAER POLYTECHNIC BRANCH was G. W. Jarman, Separations Engineering Corporation, who described the methods of beneficiation and concentration of ores, minerals, slags, scrap, and other products. Covered in his talk were specific gravity, magnetic, electrolytic, surface tension, electrostatic, and air methods of separation. Captain Watson, of the Watervliet Arsenal, spoke Oct. 20 on the use of high-speed photography in the analysis of motions too fast for visual observation.

RICE BRANCH presented L. A. Godbold at the Oct. 7 meeting. He gave a very interesting talk on the engineer's work during and after the war.

SANTA CLARA BRANCH met on Oct. 22 at which meeting Edward MacLaughlin gave a talk on his experiences during the summer at the engineering college of the University of Southern California. The next speaker was James Selna, who spoke on dimensional inspection.

TENNESSEE BRANCH decided at its Oct. 15 meeting to visit the Southern Extract Co., Dempster-Dumpster Co., and Foreign and Domestic Veneer, Inc., during November. The meeting was concluded with John Dabbs showing and explaining a series of slides on "Modern Boilers."

TEXAS TECH BRANCH reported at the Nov. 2 meeting that a new record for membership has been set with 78 members. Roy Alters stated that even this figure would soon be passed. As an incentive to the members, Fiske Hanley explained the many prizes which are given by the Society for student papers.

Texas A.&M. Gives Engine to School

A Diesel airplane engine, unique in design and of great value for research work in the engineering department, was presented to the school by TEXAS A.&M. BRANCH at the Sept. 9 meeting. This presentation was followed with a talk by E. K. Pitman, chief engineer of the Pittsburgh Shipbuilding Corp., on the classification and registration of engineers by qualifications and field. The meeting was concluded with a motion picture on the installation and operation of the Hamilton constant-speed propeller.

TULANE BRANCH had more than 60 members and guests present at the Oct. 15 meeting. The program included short addresses by Dean J. M. Robert, A. M. Hill, honorary chairman, and R. J. Cucullu, chairman of the New Orleans Section of the A.S.M.E. As a result of the efforts of Wally Diaboll, vice-chairman of the Branch, the New Orleans Public Service Co. showed a very interesting film, "Transportation in War Time."

VILLANOVA BRANCH spent the time at the Oct. 21 meeting in discussing arrangements for holding a smoker in the near future. Members of the committee included D. Cryor, A. Lyness, T. Cashin, J. Allen, A. Roth, and E. Brennan.

V.P.I. Presents a Play

The program of the Oct. 5 meeting of V.P.I. BRANCH was opened with a skit, entitled "A Day in the Life of a Virginia Tech Rat," acted by student members. J. B. Jones was presented with a slide rule and W. B. Houchens with a copy of "Marks' Handbook," for outstanding scholarship during the past semester. Last on the program was a motion picture, "Alloy Steels—A Story of Their Development."

GEORGE WASHINGTON BRANCH welcomed new members to the session held on Oct. 14. Guest speaker was Prof. A. G. Christie, past-president of the A.S.M.E., whose topic was "Creative Engineering." He showed by a number of concrete examples the great possibility for engineering research and inventiveness. Also stressed by him were the changes to be brought about in types of materials and the kinds of design trends in the postwar period.

WASHINGTON UNIVERSITY BRANCH devoted its Oct. 13 session to acquainting the new members with the benefits and purpose of the A.S.M.E. Speaker at the meeting was Prof. W. W. Horner, civil-engineering department, who spoke on the meaning and the method of registration for engineers and architects in Missouri.

WASHINGTON BRANCH opened its activities for the semester with an opening rally on Oct. 7. After a pep talk by Prof. B. T. McMinn on the value of student membership, all those present hastened to pay their dues. Committees to plan and arrange various activities were set up.

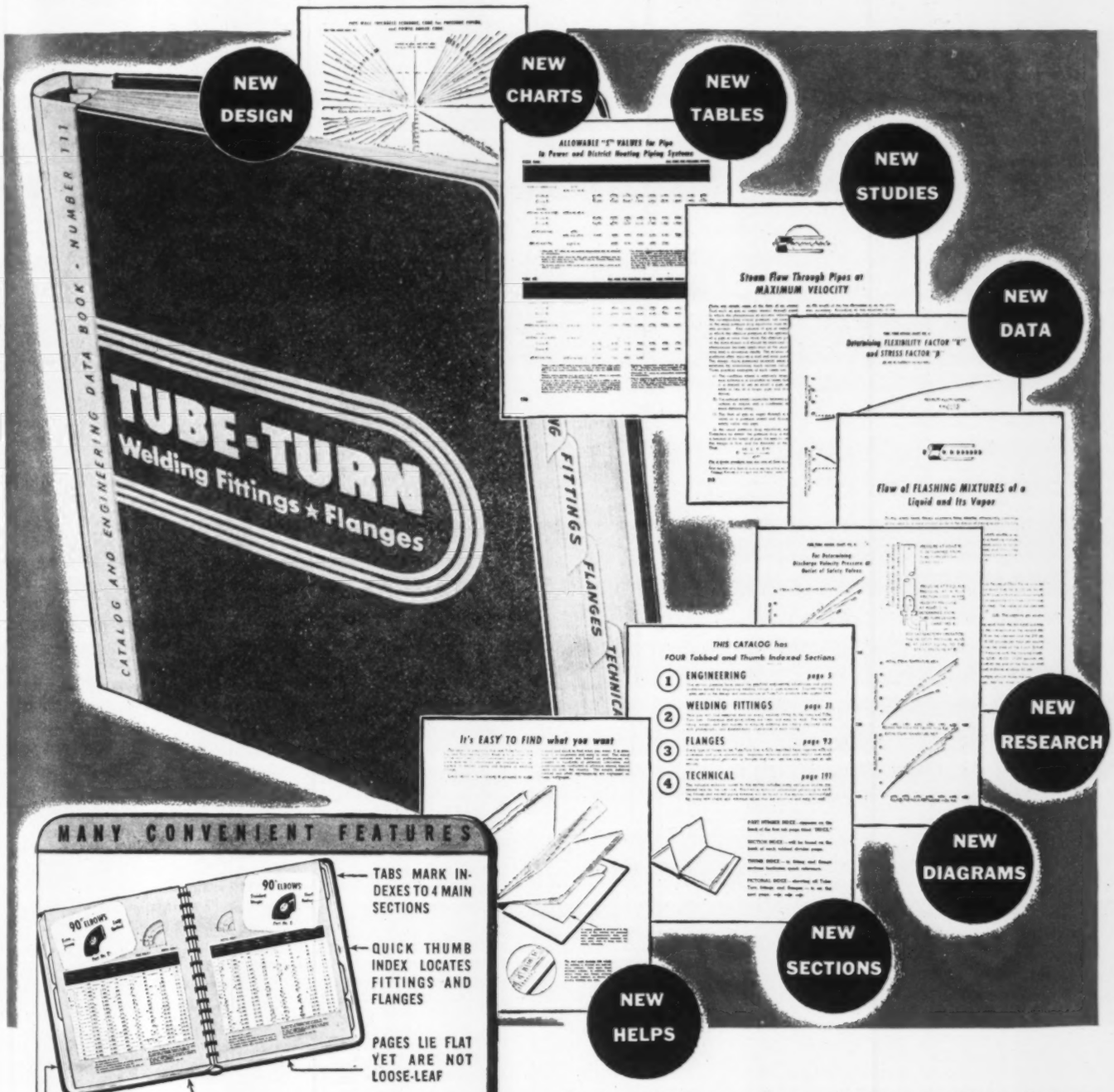
WISCONSIN BRANCH started the ball rolling for the new semester with the meeting on Oct. 14. More than 60 students heard Honorary Chairman D. W. Nelson and Chairman John Wilson tell about the many good reasons for joining the Branch. The construction of the San Francisco Bridge was shown by means of motion pictures.

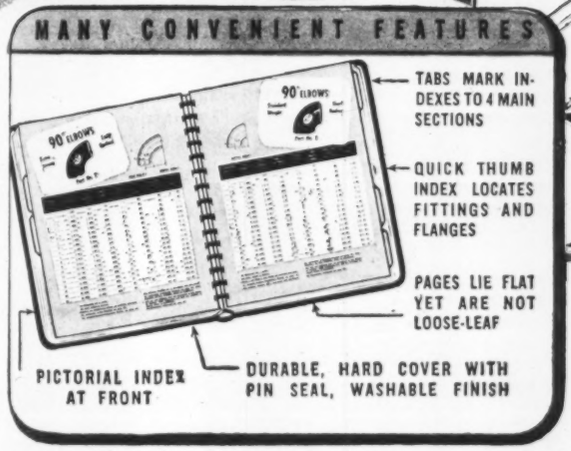
Prof. Allen Again Gasses Worcester

Prof. Charles Allen, who has been doing it for the past forty years, again presented his famous "Gas Talk" to more than 260 members and guests of WORCESTER POLY BRANCH at its first meeting of the semester on Oct. 20. He showed the many tricks that can be accomplished with the vapors of gasoline and kerosene, much to the amazement of incredulous freshmen. For example, illustrated was the correct way to light a match over the opening to the gasoline tank of an automobile.

(*A.S.M.E. News continued on page 930*)

NEW Tube-Turn Welding Fitting Catalog is full of exclusive new engineering data and user-aids!





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Engineering Societies Personnel Service, Inc.

These items are from information furnished by the Engineering Societies Personnel Service, Inc., which is under the joint management of the national societies of Civil, Electrical, Mechanical, and Mining and Metallurgical Engineers. All replies should be addressed to the key numbers indicated and mailed to the New York office. A weekly bulletin of engineering positions open is available to members of the co-operating societies at a subscription of $3 per quarter or $10 per annum, payable in advance.

New York	Boston, Mass.	Chicago	Detroit	San Francisco
8 West 40th St.	4 Park St.	211 West Wacker Drive	100 Farnsworth Ave.	57 Post Street

NOTICE

DUE to the expansion of the various Societies in the Engineering Building, the New York Office of the Engineering Societies Personnel Service, Inc., has found it necessary to secure new quarters. These quarters are located at Eight West 40th Street and will be occupied as of December 1, 1942. This move in no way disrupts the co-operation between the Engineering Societies and the Personnel Service.

MEN AVAILABLE[1]

EXPERIENCED EXECUTIVE ENGINEER AND EDUCATOR, mechanical, design specialist, desires position as dean engineering college, head department mechanical or aeronautical engineering or war position where experience and training will be utilized. Me-780.

MECHANICAL ENGINEER, 33, M.I.T. graduate, 9 years' experience design and development of high-speed Diesel engines. Executive ability. Now employed but desires responsible position with engine or equipment manufacturer. Married, family. Me-781.

POSITIONS AVAILABLE

ENGINEERS. (*a*) Research and development engineer, either mechanical or electrical, experienced in fine precision instrument work. (*b*) Production-control engineer with from three to five years' experience in precision manufacturing. (*c*) Tool engineer and designer. $5000–$7500 year. New York, N. Y. W-1340.

ADMINISTRATIVE OR OFFICE ENGINEER, mechanical, with some knowledge of machine tools. Will be in charge of office, issue purchase requisitions, engage shop personnel, for government experimental shops. About $4000 year. Northern New Jersey. W-1342.

METHODS ENGINEER with small machine-shop-practice background. Will be project engineer for certain job and have responsibility of following through shop. $4200–$4800 year. Conn. W-1350.

ASSISTANT TO PLANT EXECUTIVE for plant manufacturing small high-precision parts. Man must be capable of taking over in absence of his superior and must be acquainted with control of all plant production and costs involving machine tool operations. Permanent. New York, N. Y. W-1355.

MECHANICAL ENGINEER experienced in machine-shop methods, inspection, and gages. Work will be on fact survey of various plants for the government. Must have good personality and be able to write reports. $4500 year, plus 20 per cent overtime. N. Y. C. W-1379.

MECHANICAL ENGINEER with considerable machinery-drafting experience and creative mind. Will work in research and development department on new equipment that is ready to be put on the board. Must be able to interpret ideas and aid in the drafting of a successful commercial machine from pilot machine. Permanent. N. Y. State. W-1381.

INDUSTRIAL ENGINEER, 40–45, graduate, to take charge of industrial-engineering department for company manufacturing machine tools. Salary open. Western New York State. Interviews, New York, N. Y. W-1384.

CONTACT ENGINEER with some industrial background, to assist an executive in an industrial management firm in obtaining information concerning clients' engineering problems. Considerable traveling. $4000–$5000 year. Headquarters, northern New Jersey. W-1385.

MECHANICAL OR INDUSTRIAL ENGINEER, about 40, with some background in machine-shop practice or toolroom to supervise actually in factory-industrial operations. $5000–$7500 year. Western New York State. W-1386.

CHIEF ENGINEER in charge of design and development in conversion of small metal product to new usages. Must know small die tool jig design. $6000–$7000. Pennsylvania. W-1390.

PRODUCTION ENGINEERS to direct planning and scheduling in machine-tool plant. Will be required to co-ordinate the work of plants doing subcontracting and plan for delivery at point of assembly. One familiar with gear-making operations; other should have some experience in machining and forming of non-ferrous metals. Northern New Jersey. W-1398.

WORKS MANAGER, graduate of recognized college, qualified to assume direction of manufacturing operations of organization, 1500 employees, two-thirds women, devoted to manufacture, assembly, and calibration of delicate precision electrical instruments. Prefer man experienced in assembly-line methods in this or comparable field. Not now engaged in essential war industry. New England W-1401.

PROCUREMENT MANAGER qualified to develop and administer procurement through purchase of subcontract of numerous delicate parts for large plant devoted to manufacture, assembly, and calibration of precision electrical instruments. With assistants, will also handle expediting and administrative purchasing requirements for plant and office. Should have comparable procurement experience, preferably engineering background. Not now engaged in essential war industry. New England. W-1402.

PRODUCTION ENGINEERS to learn technique, act as instructors and then subdepartment heads in plant devoted to manufacture, assembly, and calibration of delicate precision electrical instruments. Prefer men who have had experience in precision-instrument, clock, or watchmaking. Will consider women if exceptionally qualified. $3000 year, with possibilities of rapid advancement. New England. W-1403.

PATENT ATTORNEY, 30–40, with technical education, followed by law degree with at least 5 years' practical experience with patent applications. Should be capable of organizing within company a patent division to maintain adequate records in fields of interest to the organization; review engineering development with sufficiently experienced technical eye to detect patentable features of design; prepare patent applications, general, license agreements. $4000–$5000 year. Penna. W-1406.

PRODUCT ENGINEER, under 45. Would be liaison man working between company and consumer. Problems are anticipated with metal and its alloys. Man would go out to source of trouble and report to management so corrected action could be taken. Should have experience with metallurgy and, if possible, with light metals. Able to take over sales manager's job eventually. $5000 year. Texas. W-1412.

ENGINEERS. (*a*) Personnel manager. (*b*) Factory superintendent. Company manufactures household appliances covering the whole Universal line. Processes include metal-stamping machines, screw-machine operations, plastics, foundries, forging, drop forging, heat-treating, enameling, and plating operations. $4500–$5500 year. Connecticut. W-1424B.

INDUSTRIAL ENGINEER, preferably not over 42, experienced in standard data, methods, improvement procedure, and plant layout for unbalanced line production. Not time study. Must be able to make plant surveys as to advisability of subcontracting. $4800–$5100 year. Ohio. Headquarters, N. Y. State, W-1436.

MECHANICAL DESIGNER. Must be graduate mechanical engineer with creative mind and ability to apply good sound engineering principles to designs. Work will be in development of light machinery. Knowledge principles of hydraulics helpful. Permanent, sound organization. $5000 year. Conn. W-1437B.

ENGINEERS. (*a*) Time-study supervisor to supervise work of time-study men. Should have machine shop background or previous experience with small motors. This experience is essential. $6000 year. (*b*) Methods engineer with similar experience. $6000 year. New York metropolitan area. W-1442.

INDUSTRIAL ENGINEER who has considerable experience in production methods, planning, costs, etc., in varied line of industries. Must be capable and willing to assume responsibility, and although he will be working under direction, must be able to consult with executives and tactfully insert new thoughts and methods. About $6000 year. New York, N. Y. W-1453.

ELECTRICAL OR MECHANICAL GRADUATE ENGINEER, young, up to date on wage-incentive

(*A.S.M.E. News continued on page 932*)

[1] All men listed hold some form of A.S.M.E. membership.

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HOWARD has long been a dominant name in the nonferrous castings field. Howard castings have been widely used in many well known machines and equipments.

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Naturally, America's war industries have turned to this dependable source of nonferrous castings; and all three plants are supplying the needs of makers of planes, guns, tanks, ships, military vehicles and essential machines.

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work and capable of taking charge of such work within a reasonably short time. Position permanent for right man. For 50-hour week during war, $4000 year; for 40-hour week, $3300 year. Minneapolis, Minn. R-1162-C.

ENGINEERS. (*a*) Naval architect experienced in design of small speed boats, motor launches, and any other small floating equipment. (*b*) Marine engineers experienced in layout design for internal-combustion and Diesel engines in these boats. (*d*) Design expediters to act as liaison between contractors on design for above equipment. $3800 year. Washington, D. C. W-1454.

A.S.M.E. Local Sections

Coming Meetings

Akron-Canton. January 13, 6:30 p.m. Meeting will be at Akron. Speaker J. H. Van Deventer, president and editor, *Iron Age*, Subject to be announced. Speaker: Paton Edwards, Advertising Art Service, Subject: "Chalk Talk." This is to be a nontechnical meeting to which women are invited.

Boston: December 10, at 6:30 p.m. Walker Memorial Building, Massachusetts Institute of Technology. Subject: "Recent Developments in Power Generation," by Lionel S. Marks, professor emeritus, Harvard University.

Columbus. December 11, 8:00 p.m. Battelle Memorial Institute, Columbus. Speaker, G. B. Eaton, development engineer, Curtiss Wright, Columbus, Ohio. Subject: "Airplane Design."

St. Louis. December 18. A panel discussion of "The Functions of Industrial Engineering in Industry." Meeting to be conducted by Edgar H. Behle, industrial engineer, Rice-Stix Dry Goods Co., St. Louis, Mo. Joint with Industrial Management Society of St. Louis.

Southern California. December 10. Sam S. Hansen, chief industrial engineer, General Petroleum Co. of California. Subject: "Lubrication."

South Texas. December 11, 8:00 p.m. Houston Engineers Club. Subject: "The Correlated Responsibilities of Industry and Labor During The War Emergency," by Dexter S. Kimball, Honorary Member and Past-President, A.S.M.E.

West Virginia. December 8, at 8:00 p.m. The Daniel Boone Hotel, Charleston, W. Va. Subject: "The Railways at War," by L. K. Sillcox, first vice-president, The New York Air Brake Co., Watertown, N. Y.

Candidates for Membership and Transfer in the A.S.M.E.

THE application of each of the candidates listed below is to be voted on after December 24, 1942, provided no objection thereto is made before that date, and provided satisfactory replies have been received from the required number of references. Any member who has either comments or objections should write to the secretary of The American Society of Mechanical Engineers immediately.

KEY TO ABBREVIATIONS

Re = Re-election; Rt = Reinstatement; Rt & T = Reinstatement and Transfer to Member.

NEW APPLICATIONS

For Member, Associate, or Junior

ALEXANDER, BEATINA W., Elizabeth, N. J.
ANDES, PROF. AMMON S., Pullman, Wash.
BECK, CARL H., Wilmerding, Pa.
BOTWINIK, NORMAN I., New Haven, Conn.
BOUILLON, LINCOLN, Seattle, Wash.
BRIND, JOS. W., Twickenham, Middlesex, England
CARR, R. H., Chicago, Ill.
CARR-HARRIS, GORDON G. M. (Major), Detroit, Mich.
CASSIDY, FRANCIS R., Bayside, N. Y. (Re)
CHOWNING, JAS. R., Wilmington, Del.
CITRON, ELMER H., JOPLIN, Mo.
CLARK, LEO E., Westfield, N. J.
COOPER, LEO J., Essex Fells, N. J.
DANNEMAN, FRED C., New York, N. Y.
DEMAREST, LAURENS M., New York, N. Y.
DIBBLE, CHAS. G., Scotia, N. Y.
DOWN, SIDNEY G., Pittsburgh, Pa.
ELLINGSON, MARK, Rochester, N. Y.
ENGLE, ROBERT W., Los Angeles, Calif.
FINK, DR. GEO. R., Detroit, Mich.
FROST, WM. G., JR., Chicago, Ill.
GALAZZI, JOS. A., York, Pa.
GALE, FRANK C., Wichita, Kans.
GANZ, JOHN M., Hamilton, Ohio
GROVES, DONALD G., New Baltimore, Mich.
HAMBLETON, WARNER V., Louisville, Ky.
HARRIGAN, HOWARD H., Takoma Park, Md.
HOIRIIS, HOLGER, Berkeley, Calif.
HOROWITZ, I. H., New York, N. Y. (Rt & T)
HOTZE, E. G., Tulsa, Okla.
JACOBS, LEONARD, Philadelphia, Pa.
JOHNSON, E. SIGURD, Pittsburgh, Pa.
JUSTICE, C. T., Sterlington, La.
KEITH, BRUCE G. (Lieut.), Borger, Tex.
KLEIN, SAML. J., Detroit, Mich.
KNOWLTON, A. E., Short Beach, Conn.
KRINNER, LUDWIG, Pittsburgh, Pa. (Rt & T)
KUHN, SHANNON, Washington, D. C.
LACHMAN, LOUIS A., New London, Conn.
LEGGETT, JAS. T., JR., Gainesville, Fla.
LESTER, SAUL, New York, N. Y.
MASTERS, W. C., Pittsburgh, Pa.
MEADE, JOS. F., Hammondsport, N. Y.
MELENDEZ, VICTOR E., Guatemala City, Guatemala
MILL, VICTOR J., Lawrence, Mass.
MOSHER, HAROLD A., Rochester, N. Y.
MURPHY, GORDON, Beloit, Wis.
OPP, GEO. C. A., Detroit, Mich.
PATON, W. J. R., Toronto, Ont., Can.
PHILIPP, GERALD, Rochester, N. Y.
PODOLSKY, JOHN P., Jersey City, N. J.
PRICE, ROBERT B., Oakland, Calif. (Rt & T)
REED, HERBERT P., Devon, Conn.
ROBERTSON, J. M., Washington, D. C.
RICHTMANN, W. M., Golden, Colo. (Rt & T)
SCHLIEDER, HAROLD A., Erie, Pa.
SHEVLIN, ARTHUR R., Woonsocket, R. I.
STONE, ALBERT R., Baltimore, Md.
SULLIVAN, H. H., Rochester, N. Y. (Rt)
TEAL, F. MARTIN, LOCKPORT, N. Y.
VAN WIE, JOHN A., JR., Rochester, N. Y.
WEBB, R. D., South Charleston, W. Va.
WICKS, C. J., Muskegon, Mich.
WIGREN, CLARENCE F., New York, N. Y. (Rt)
WILDER, HERBERT P., Scarsdale, N. Y.
WILSON, J. D., SR., Brooklyn, N. Y.
YOUNG, JAS. F., Schenectady, N. Y. (Re)

CHANGE OF GRADING

Transfer to Fellow

KIDDE, WALTER, Montclair, N. J.

Transfers to Member

CARNES, PAUL S., Los Angeles, Calif.
COPPERSMITH, FREDK. M., Brooklyn, N. Y.
DREW, WALTER E., Jacksonville, Fla.
MC KAIG, W. WALLACE, Cumberland, Md.
MOSHER, FRED. D., Erie, Pa.
ORRELL, JOHN E., Wichita Falls, Tex.
RATCLIFF, VERN H., Ames, Iowa
SCHEIDEMANTLE, HERBERT S., Erie, Pa.
WALTERS, JOHN C., Bristol, Conn.
WATKINSON, Brooklyn, N. Y.
WHITE, ALBERT O., Scotia, N. Y.

A.S.M.E. Transactions for November, 1942

THE November, 1942, issue of the Transactions of the A.S.M.E. contains:

Structural-Steel Tolerances at Bonneville, by T. M. Ober

Test Characteristics of a Combined Pump-Turbine Model With Wicket Gates, by R. V. Terry and F. E. Jaski

The Foren Mill for Rolling Seamless Tubes Achieves Virtually Continuous Production, by E. W. Wrage

The Analysis of a Continuous Process by a Discontinuous Step Method, by J. A. Hrones

Optimum Settings for Automatic Controllers, by J. G. Ziegler and N. B. Nichols

Report on Tubular Creep Tests, by F. H. Norton and C. R. Soderberg

A Review of Heat-Transfer Coefficients and Friction Factors for Tubular Heat Exchangers, by B. E. Short

Condensation of Saturated Freon-12 Vapor on a Bank of Horizontal Tubes, by F. L. Young and W. J. Wohlenberg

Heat Transfer, Pressure Drop, and Fouling Rates of Liquids for Continuous and Noncontinuous Longitudinal Fins, by A. Y. Gunter and W. A. Shaw

Protecting Buried Metals Against Corrosion, by Starr Thayer

The Application of Cathodic Protection for Corrosion Prevention, by R. J. Sullivan

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- *NEW EQUIPMENT*
- *BUSINESS CHANGES*
- *LATEST CATALOGS*

Available literature may be secured by addressing a request to the Advertising Department of MECHANICAL ENGINEERING or by writing direct to the manufacturer and mentioning MECHANICAL ENGINEERING as a source.

• NEW EQUIPMENT

Importance of Arc Welding Symbolized by New Stamp

The tremendous part arc welding is playing in the war effort of the Union of South Africa has been recognized by the issuance of a special postage stamp. This indicates that the Union is not lagging behind other countries in the use of this new industrial giant in the construction of her ships, tanks, aircraft and similar equipment.

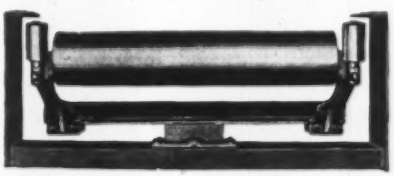
The photographs, supplied by The Lincoln Electric Company, Cleveland, Ohio, shows two of the stamps which are of 6d value. Each stamp is printed both in English, as shown on the right, or Afrikaans, as on the left. This is the case with all stamps issued in South Africa.

The stamp depicts a welder using modern shielded electric arc equipment and dressed in protective head shield, gloves and other special clothing.

Lincoln Electric officials say that as far as they know, this is the first time that such a stamp has been issued in the history of either stamps or welding.

Link-Belt Self-Aligning Idler for Flat-Roll Conveyor Belts

Another new product—a swiveling, positive, self-aligning idler for automatically correcting misalignment of either carrying or return runs of non-reversing conveyor belts supported on flat-roll idlers, is announced by Link-Belt Company, Indianapolis, Ind.



This new Link-Belt idler has a centrally pivoted cross member which, besides being equipped with a flat idler roll for supporting the belt, has a vertically-mounted actuating roll at each end for lightly contacting the edge of the belt when its lateral misalignment exceeds a predetermined amount.

As but a slight pressure of belt edge against actuating roll serves to swivel the idler unit on its pivot sufficiently to guide the belt automatically, quickly, positively, back to proper alignment, any possibility of injury to belt edge is said to be avoided.

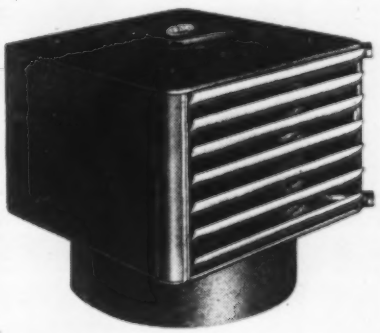
When used on return runs, one idler should be placed close to tail or takeup shaft so that the belt will be guided centrally on the pulley, and one at every ten or fifteen idler spaces. On the carrying run, one idler should be placed just beyond the loading chute, and one at every ten or fifteen spaces thereafter.

For flat-roll belt conveyors that must operate in either direction, self-aligning idlers of special design are available.

Folder A-599 gives sizes, dimensions, weights and list prices.

Carrier Five-way Unit Heaters

A new unit heater, designed to provide quick, economical and thorough heating for industrial and many types of commercial buildings, has just been announced by Carrier Corp., Syracuse, N. Y. Called the "Carrier Five-Way Unit Heater" because of its ability to discharge heat in five directions—outward four ways and downward—the equipment combines unusual flexibility, great floor coverage and the ability to heat from great heights, according to Carrier Marketing Vice President, E. T. Murphy.



Available with steam or hot water coils, the unit is suspension type, discharging the heated air out and downward for complete coverage of large floor areas. The direction of air discharge may be made at any angle by adjusting the louvers in the outlets of the unit. Independently adjustable, each louver may be set to deflect air streams for perfect coverage.

Though housed in the unit, the motor is in the entering cool air stream and is further protected from the heat of the coils by a circular shield.

Standard units have two outlets located on opposite sides with the other two sides consisting of a removable panel which may be replaced by outlets when desired. Louvers and panels may be interchanged even after installation, affording a flexibility to meet building changes not obtained with many other types of unit heaters, the Carrier announcement says.

Carrier engineers report that because of the high velocity and great penetrating power which the 5-way Unit Heater possesses, it is possible to heat efficiently from as high as 45 feet off the floor.

Due to this high velocity and its resultant penetration, the Carrier 5-Way Unit, in actual operation, has been found to heat a larger area than that covered by any other vertical unit, making it possible to heat large areas with fewer units. A typical industrial installation of the two-outlet large size 5-way, showed that adequate heat is obtained as far away as 120 feet in each direction from the heater, or a total of 240 feet in an oblong area.

The fact that the smaller sizes are quiet in operation at top speed and that the top and bottom panels of all units are finished in a new "tapestry" enamel makes these units attractive for many types of commercial installations.

Complete specifications are presented in a new data sheet.

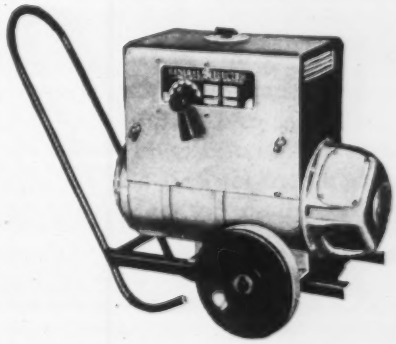
New Minneapolis-Honeywell Thermostats

Two new thermostats of horizontal design are announced by Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

These thermostats are available in two types, one for heating applications, the other for heating and/or cooling. They have been purposely designed for use where accurate and dependable control of line voltage, heavy duty devices are involved and are capable of handling directly large motor driven units, cold blowers, cooling equipment, industrial and commercial stoker fired heating plants, etc. On larger or polyphase motors they should be used in connection with magnetic starters. Where desired, of course, they can be used in low voltage circuits.

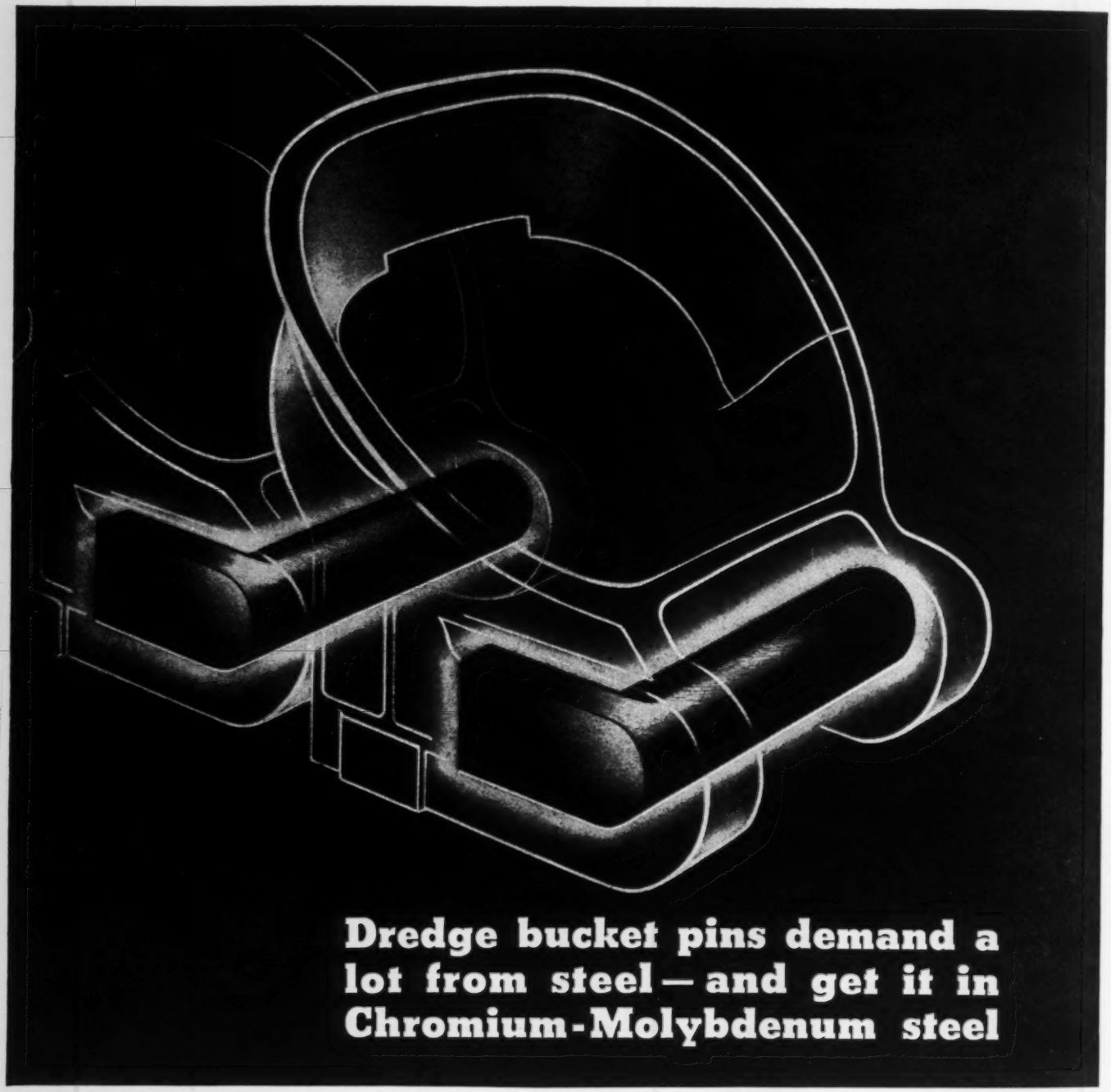
The horizontal design provides maximum air circulation and greatly reduces the effect of contact heat. The new M-H Con-T c-Tor Snap-Switch provides the switching ac-tion. This is a non-magnetic switch, self enclosed to protect it from dirt, dust, moisture and grime, and has been proved by ex-haustive tests to be capable of years of de-pendable service. Another distinctive fea-ture is the temperature setting knob which can be removed to lock the thermostat in order to prevent unauthorized tampering. Models are also available with a "positive on" feature for cooling applications.

Strikeasy
New Arc Welder for Thin-Gage and Aircraft Welding



A new 150-ampere direct-current arc welder, the Strikeasy, has been announced by the General Electric Company for use in fabricating bright-surfaced, thin-gage metals, such as aircraft tubing (SAE-4130) which has a wall thickness of 35 mils. Based on extensive research and experience, the design and characteristics of the new welder have been especially developed to help operators produce strong, uniform joints quickly and easily without spoilage.

Continued on Page 19



Dredge bucket pins demand a lot from steel—and get it in Chromium-Molybdenum steel

Dredge bucket pins are heavy (4-8 inches diameter), must withstand heavy static and impact loads, and must have extra good wear resistance. It is a tough assignment for any steel.

A medium carbon Chromium-Molybdenum steel developing uniform hardness in heavy sections is being used for this application.

Here is a permanent place for one of the most versatile of alloy steels—a steel that, with minor variations in carbon and manganese content, is meeting requirements in parts ranging from 0.065" wall aircraft tubing to 12" shafting. This steel, together with many other Molybdenum Steels, is covered in detail in our free technical book "Molybdenum in Steel".

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.
MOLYBDIC OXIDE—BRIQUETTED OR CANNED • FERROMOLYBDENUM • CALCIUM MOLYBDATE

Climax Molybdenum Company
500 Fifth Avenue • New York City

MOLY

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Chief among the important features of the Strikeasy arc welder is its "pep" or extra high instantaneous recovery of voltage (40 to 60 volts) which helps the operator to strike the arc with ease under the difficulties presented by thin metals having a bright, polished surface. Rapid, accurate adjustment of the welding current is also provided by means of a tap switch and a rheostat; the former for speed in getting wide range adjustments, and the latter for accuracy in obtaining the exact number of amperes needed for best results. The wide welding range permits the use of shielded-arc electrodes as large as $^3/_{16}$ in. in diameter and as small as $^3/_{64}$ in. in diameter.

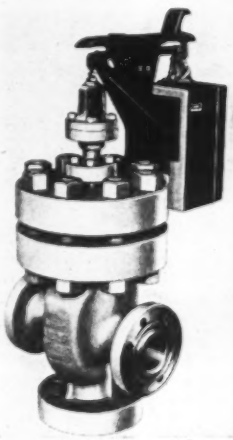
As a further aid to the operator in producing welds of uniform strength, the Strikeasy arc welder may be used with a remote-control device for reducing the current when the operator wants to fill a weld crater or when a reduction of heat is needed to avoid burn-through.

The equipment is horizontally mounted to assure efficient lubrication, and to avoid excessive end thrust on its selfsealed ball-bearings. Cool operation is obtained by means of a fan cooling system, while isothermic relays guard against operation on harmful overloads.

Compact and easy to handle, the Strikeasy arc welder is available with or without running gear. Without running gear, the over-all dimensions are: length, 28 in., width $13^1/_2$ in., and height 21 in.; net weight 385 lb. With running gear over-all dimensions are: length, 40 in., width, 16 in., and height, 27 in ; weight, 415 lb net.

High Pressure Power Control Valve

The Ashcroft Power Control Valve for high pressure installation from 1800 to 2500 lbs. is announced by the Consolidated Safety Valve Division of Manning, Maxwell & Moore, Inc., Bridgeport, Conn.



This new Power Control Valve is an automatic relief valve that may be set for a 1% or less difference between opening and closing pressure; which effects a large saving over the 4% required for the spring loaded safety Valves. The immediate results are more accurately balanced boiler operation at peak loads and more uniform line pressure. In addition, its use reduces spring-loaded safety valve maintenance expense.

The regular spring-loaded safety valves rarely pop in service when an Ashcroft Power Control Valve is used. The Power Control Valve is set to open at a slightly lower pressure than any of the safety valves, making it possible to continue a more even rate of steaming with a more uniform line pressure.

The principle of operation of the Ashcroft Power Control Valve is very simple. The boiler drum or superheater outlet pressure or steam header pressure actuates a pressure control set at the popping pressure, which operates an electric contact on a difference in pressure of 1% or less. The electric current is transmitted to a solenoid which opens and closes the Pilot Valve. When it opens it unbalances the pressure over the main valve disc and it opens and remains open until the pilot valve is closed. The whole cycle of operation is almost instantaneous. The Power Control Valve opens exactly at the popping pressure and it closes cleanly with an extremely low blow-down. High superheat temperatures have no effect on its action. It may be operated manually from the control station.

The Ashcroft Power Control Valve is not intended to replace the spring-loaded safety valve, but rather it is a supplementary operating valve, designed to conserve power and increase the efficiency of the steam generating plant.

A complete new, descriptive catalog fully illustrated with installation drawings, will be furnished anyone interested in Power Control Valves, by simply writing to the above company and requesting a copy of this new handbook.

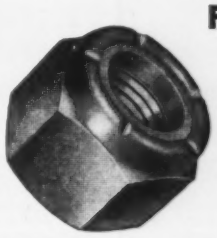
New Vibration Resistant Relay

The compactly constructed unit, illustrated, is the new Series 165 Vibration Resistant Relay by Guardian Electric, specifically designed for applications having a serious vibration problem such as aircraft, generator mountings, etc.

The Series 165, 24 volt DC Relay (also available for AC in the Series 160), is exceptionally resistant to vibration, achieved largely by careful counterbalancing of the

Continued on Page 20

For VIBRATION-PROOF FASTENINGS on MECHANICAL and ELECTRICAL EQUIPMENT



Elastic Stop Self-locking Nuts put an end to maintenance troubles resulting from loose fastenings. They can not be loosened by vibration, shock loads, or exposure to weather. Retain self-locking effectiveness when removed and used over and over. Available in all standard sizes and thread systems.

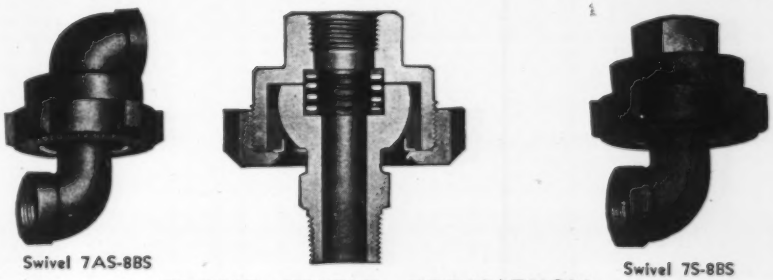
SPECIFY THEM ON NEW EQUIPMENT AND USE THEM FOR REPLACEMENT

CATALOG contains a graphic explanation of the Elastic Stop principle, presents test and application data, and lists the complete line of nuts. • **Write for a copy.**

ELASTIC STOP NUT CORPORATION
2375 VAUXHALL ROAD • UNION, NEW JERSEY

Elastic Stop SELF-LOCKING NUTS

BARCO SWIVEL JOINTS



Swivel 7AS-8BS

Swivel 7S-8BS

PROVE THEIR EFFICIENCY THROUGH LOWER MAINTENANCE COST

For Steam • Air • Oil • Gas • and Other Fluids

Send us your . . . Hydraulic Joint Problems

BARCO SWIVEL JOINTS

Specify Pressure and Temperature Involved

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In Canada—The Holden Co. Ltd.

Write for Catalog

HARNESSING THE WHIRLWIND!

THE BUELL DUST RECOVERY SYSTEM DOES IT... with the famous van Tongeren Cyclone, the only method of harnessing the whirlwind energy of the "double eddy current" (present in all cyclone-type collectors) and putting it to work to give you greater collection efficiency on all dust sizes.

No Other Collector Employs This Principle

Only Buell gives you the *plus* value of the van Tongeren System's greater recovery efficiency. *It saved one user $40,000 in 13 months!* Buell (van Tongeren) Dust Collectors have many other advantages . . . all good reasons why so many industrial leaders prefer Buell. Investigate!

24-page bulletin, "Dust in Industry" sent on request

buell
DUST COLLECTORS

BUELL ENGINEERING COMPANY, Inc. Suite 5000, 75 Pearl Street, New York
NATION-WIDE SERVICE THROUGH OFFICES OF EITHER BUELL ENGINEERING CO. OR B. F. STURTEVANT CO.

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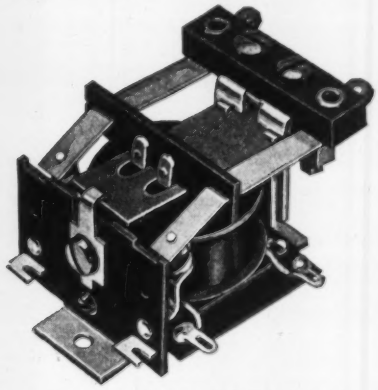
armature assembly and due in no small degree to the compact design of contact assemblies and its generally sturdy and scientifically balanced construction.

The manufacturer states that tests conducted by the laboratory of one of the leading U. S. airlines substantiated earlier findings that the Series 165 Relay, with two normally open contacts, would withstand a vibration test of 16.2 times gravity without making contact when the coil was de-energized, or breaking contact with the coil energized. The company claims that 16.2 (G's) is not the maximum vibration resistance of the relay, representing the maximum obtainable on the testing machine.



Further vibration life tests by another user on one of the original production models, since improved, required 230 hours of continuous vibration at 110 cycles per second, with the Series 165 relay tested in two positions 90° apart, before it became inoperable. These relays are said to be entirely insulated from ground with insulation withstanding a minimum of 1500 volts. The field piece and armature are of annealed magnetic iron. Tinned phosphor bronze blades carry heavy fine silver points. All contacts are connected to tinned solder lugs.

Contact combinations up to double pole, double throw are available, with contact capacity up to 12.5 amperes per pole, measured at 110 volt, 60 cycle, non-inductive AC. Contact rating for aircraft use is 8 amperes at 24 volts DC. Other voltages and contact combinations are available. On inductive loads, condensers are sometimes recommended to suppress arcing, their value being determined by test. Overall dimensions are $2^1/_2$" × $1^9/_{16}$" × $1^5/_8$". Weight (DPST contacts): 5 ounces.

Manufacturer states that specific approvals for several aircraft applications have already been granted by the army air corps, that it is necessary to give application and other pertinent details when making inquiry. Product of Guardian Electric, Dept. 165, 1619 West Walnut St., Chicago, Ill.

Propulsion Machinery Begun for 35 New Maritime Tankers

Construction has been started on a $13,000,000 order for turbine electric propulsion units to drive 35 U. S. Maritime Commission tankers, according to R. A. McCarty, Westinghouse Vice President. The equipment is being manufactured in the Company's South Philadelphia and East Pittsburgh works. The new tankers which will each carry approximately 140,000 barrels of oil are an important part of the Maritime Commission's national defense ship-building program. Sun Shipbuilding and Dry Dock Co. will build the tankers at Chester, Pa.

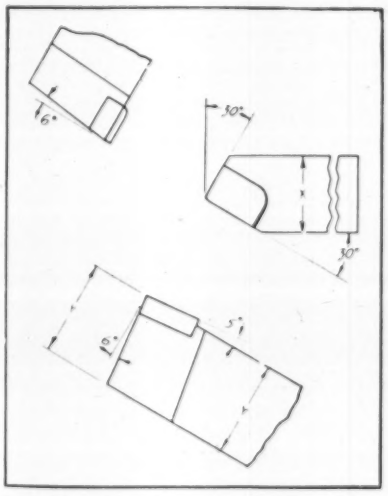
In order to hasten deliveries the new tanker propulsion units will not include speed re-

duction gears, which usually are a part of ship machinery. Each tanker will be driven by a 6600 horsepower electric motor, using power produced by a turbo-generator. The turbo-generator will operate at a high speed, most economical for such machines. The motor, however, will rotate at a much lower speed, around 93 revolutions per minute, the most economical propeller speed. The necessity of gears to connect driving apparatus is eliminated. Turbine electric drives can be produced faster than geared turbine units. The plant's output of gears, which requires complicated manufacturing processes, is needed for other vessels.

The South Philadelphia plant is now at work on geared turbine propulsion equipment for other tankers, which will be among the fastest ships of their type yet designed. They will be able to meet the requirements of speedy Navy fighting ships if called for emergency duty. Westinghouse merchant marine orders also include equipment for Maritime Commision cargo ships and Great Lakes ore carriers.

Turning and Facing Tools

A new standard series of Kennametal tools in large turning and facing styles for heavy machining has been developed by the McKenna Metals Co., 367 Lloyd Avenue, Latrobe, Pa. The position of the tip in the shank (see illustration) permits a greater thickness of steel under the cutting point of



the tip, permits the top surface or chip breaker to be ground without the necessity of grinding away steel, and during the life of the tool the height of the cutting point is retained rather than being lowered each time the tool is ground.

Tools of this design are available in all turning and facing styles and in all shank sizes 1 inch and larger.

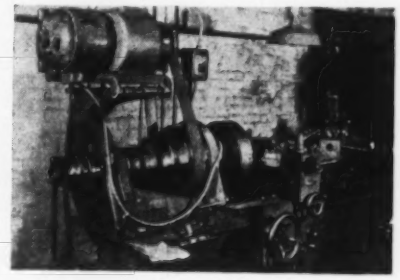
Shipment of these and other Kennametal Standard or Modified steel-cutting carbide tools is made in 10 to 14 days.

Reeves Machine Tool Drive

Reeves Pulley Co., Columbus, Ind., now offers the Reeves Machine Tool Drive, a motorized variable speed drive for machine tools which eliminates necessity of building a special support or bracket in order to mount Reeves variable speed control units on machine tools.

This drive utilizes either the Reeves Vari-Speed Motodrive, as shown in cut, or the countershaft type Vari-Speed Motor Pulley. It comprises a symmetrical, compact assembly of constant speed driving motor, variable speed unit and mounting bracket which can be easily and quickly attached to most machine tools by means of four cap screws.

Smooth, quiet, vibrationless transmission of power from drive to driven machine is assured and any speed at all within the limits of the particular unit applied may be instantly obtained by turning a handwheel and without stopping the driven machine.

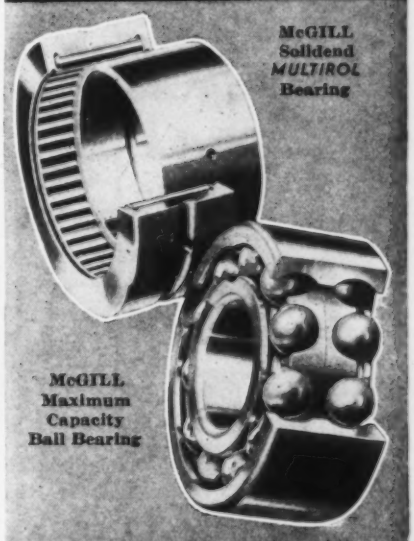


Motor and variable speed unit are mounted on a pivoting base at the top of a cast semi-steel bracket. Jack screws in the bracket at the end opposite the speed control unit provide for maintenance of proper belt tension between the driving unit and driven pulley on the machine. Tension is uniformly maintained at all times by a lock screw.

Two sizes of bracket are available. With the Motodrive, capacities are from 1/4 to 10 HP, depending on size of unit used, and speed ratios from 2:1 through 6:1 are available. Single reduction gear reducer is available if required.

Continued on Page 22

McGILL
PRECISION BALL and MULTIROL BEARINGS



BEARING DIVISION
McGILL
MANUFACTURING CO.
1100 North Lafayette Street
VALPARAISO, INDIANA

You Get 20* TIMES MORE
Actual Filtering Area with NUGENT DUPLEX FILTERS

FIG. 1116 SV-O

*(20 times greater than most filters of comparable size, which means a 20 times greater interval between cleanings.)

NUGENT TRADE MARK

NUGENT DUPLEX FUEL OIL FILTERS make it easy for you to maintain continuous protection year in and year out on fuel oil lines. Far from being just "ordinary" filters, Duplex Filters are specially designed, patented units built for rugged, long-life service. Nugent's special woven, acid resisting, *lintless* textile filter element removes particles as small as .0003, to produce 99-8/10% clean oil. Duplex units are offered in 5 sizes. Write today for complete information and literature.

Specify Nugent Fuel and Lube Oil Filters for Your Diesels.

WM. W. NUGENT & CO., INC., Established 1897
407 N. Hermitage Ave., Chicago, Illinois

Three 12,500 CFM "R-C" Blowers installed where maximum volume is frequently needed in hottest summer temperature.

HERE'S *Blower Capacity*

UNAFFECTED BY TEMPERATURE CHANGES

As an example, the capacity of a 500 HP Roots-Connersville Positive Displacement Constant Speed Blower will vary only 1½% with a 100° change in inlet air temperature. Moreover, "R-C" Blowers *save power* by building up just enough pressure to do the job you assign to them—and power used is in direct proportion to speed and pressure.

Isn't this the operating characteristic and efficiency you want? Then why not put your air moving problems up to "R-C" engineers. No obligation. Write today.

ALL OUT for VICTORY

ROOTS CONNERSVILLE BLOWER CORP.
201 MICHIGAN AVENUE
CONNERSVILLE INDIANA

NEW YORK • CHICAGO • POTTSTOWN, PA. • SAN FRANCISCO
PITTSBURGH • BOSTON • DETROIT • ST. LOUIS • LOS ANGELES

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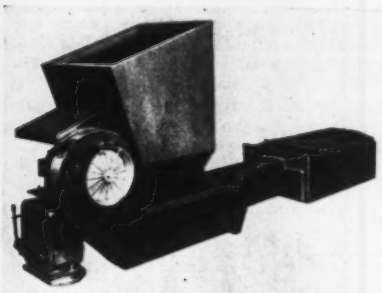
Using the Vari-Speed Motor Pulley, capacities range from ¾ to 7½ HP and cover speed ranges of either 2¾:1 or 3:1 ratio.

Both Motodrive and Vari-Speed Motor Pulley are available for either constant torque or constant horsepower applications, as the job may require. Type of work to be handled, and horsepower and speed ratio required, largely determine the choice of Reeves speed control unit to be used.

Underfeed Screw Type Stokers



The Frederick Iron & Steel Co., Frederick, Md., announce their redesigned line of commercial and industrial underfeed screw type stokers. This line incorporates hopper and bin feed models, with clinker type burners (illustrated) or with side dumping grates; sizes range from 200# to 850# of coal per hour.

They are equipped with large, heavy duty, three speed automotive type transmissions, oversized motors and fans. Totally enclosed windboxes and stoker fronts are provided to assure air tight air chambers and to eliminate much installation expense. Two doors in the stoker front provide for positive windbox cleanout.

They have full active self contained burning ends made up of segmental type tuyeres which are interlocking, thus eliminating the danger of their becoming loose in the fire; yet they are easily replaceable if necessary.

Ambidextrous, Two-Fisted Welder Has Hands Full

That American welders have their hands full with the defense effort is generally acknowledged, but rarely is a picture taken of a welder as busy as R. H. Oliver of St. Louis, Missouri.

Oliver, a two-fisted welder if there ever was one, sent the accompanying photograph to A. F. Davis, Vice-President of The Lincoln Electric Co., Coit Ave. & Kirby Road, Cleveland, Ohio. He is welding tractor rollers with both hands, according to his letter. The electrode he is manipulating with his

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right hand is receiving current from a 400 ampere portable welder and the one in his left hand is "powered" by a 150 ampere welder, the letter states.

New Ozalid Model "B" Whiteprint Machine

Ozalid's new Model "B" Whiteprint machine—especially designed to meet industry's heaviest print making demands—is capable of producing finished whiteprints at speeds up to 20′ per minute—the fastest speed in dry developed print making!

This newest Ozalid Whiteprint machine contains such features as synchronized printing and developing, permitting the use of continuous yardage as well as cut sheets . . a temperature control for the printing cylinder so that the entire range of Ozalid sensitized materials can be printed with maximum results . . . and a special light conveniently placed above the print receiving tray enabling the operator to check prints for correct printing and developing speeds when the prints are delivered at the rear of the machine.

Other distinctive features include front or rear delivery of prints . . an adjustable burner shade to permit running prints of varying opacity without changing the printing speeds . . . an automatic air pickoff . . . and an effective blower hook-up.

The Model "B", as all other Ozalid Whiteprint machines, combines printer and developer in one compact unit. Ozalid whiteprints are made in two easy steps—exposure and dry development. The original drawing is placed on a piece of light sensitive Ozalid material and fed to the machine. First the Ozalid material is exposed to a mercury vapor lamp for printing, and then is conveyed automatically over a developing tank and dry developed when the material comes in contact with ammonia fumes. Only one operator is required to handle the entire print production.

The Model "B" uses all of Ozalid's complete long line of standard sensitized materials, transparent materials including foils, and specialties—paper coated on both sides, air mail weight paper, paper laminated on cloth and opaque cloth. It is silent in operation—neat, trim in appearance—and can easily be installed in the drafting room, plant or office. It was placed on the market by Ozalid Products Division, General Aniline and Film Corporation, Johnson City, New York.

High Power for Engine Cooling

Two large blowers, each powered by a General Electric 2000-horsepower motor, will deliver sufficient cooling air to airplane-engine test stands at Wright Field, Dayton, Ohio, to absorb 20,000,000 Btu per hour. This is equivalent to absorbing the heat output of a ton of coal burning in this length of time.

When set up for testing, the airplane engines will be fastened to torque stands, and test propellers attached to furnish load. With this method of testing, all the output of the engines is released into the air in the form of heat. To cool the engines and to get rid of this heat, blowers, installed below the engines, will pull air from outside over the test stands and through an opening in the floor into a concrete tunnel, finally discharging it out-of-doors.

The required air pressure will be maintained in each test stand to keep the engine temperature approximately at one level. To accomplish this, General Electric engineers have developed a control system which functions from a pressure responsive device. If a change in pressure should occur, this device will react and the motor speed will be varied automatically until the predetermined pressure is reached.

Conduit System Air Conditioning

Charleston, W. Va., (Special) Tenants in the new, 12-story United Carbon Company Building which opened here today will be able to "dial" their own Winter and Summer room temperatures through the building's up-to-the-minute "Conduit Weathermaster" air conditioning system, according to Edward T. Murphy, vice president in charge of marketing, Carrier Corp., Syracuse, N. Y.

"Occupants have only to dial the desired temperature and an automatic valve will vary the quantity of hot or cold water to fulfill the desired condition," Mr. Murphy said. "It is possible to maintain 80 degrees temperature in one room and 71 in the next, a simultaneous temperature difference of 9 degrees in adjoining rooms."

The Charleston office building is the second to be equipped with the new Carrier Conduit System announced last June by Dr. Willis H. Carrier, of Syracuse, N. Y. The newest method of air conditioning is adapted primarily to office buildings, apartment houses, hospitals, hotels and other multi-room structures.

A Carrier centrifugal refrigeration machine of 170 ton cooling capacity furnishes refrigeration for the Charleston building's air conditioning system, Mr. Murphy said. A centrifugal-type compressor driven by a condensing-type turbine is used in the installation to chill the 350 gallons of water in circulation throughout the system. The condensing turbine is supplied with steam from a gas-fired boiler which is used for the normal winter heating requirements. River water at approximately 85 degrees is used for condensing. Chilled water, leaving the cooler, is approximately 42 degrees.

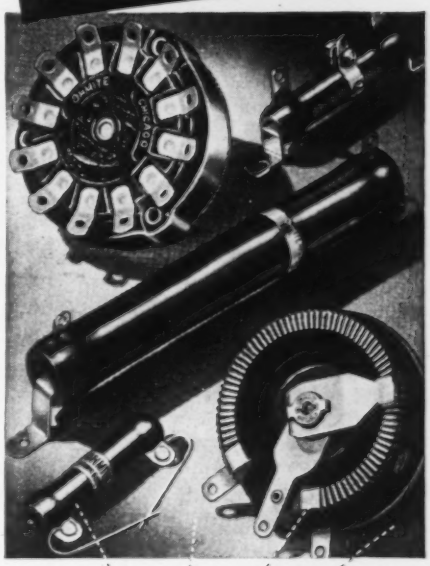
The conduit air distributing system makes it possible to send conditioned air at high velocities through small conduits to the various rooms where "Weathermaster" units control the amount of cooling or heating desired, Mr. Murphy declared.

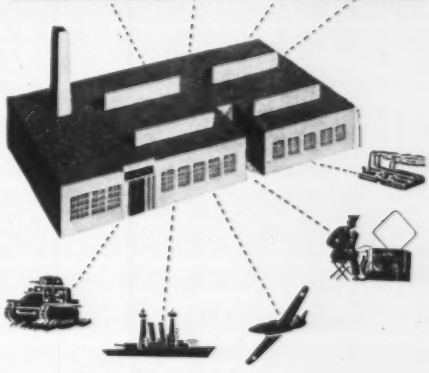
The air handling equipment, which supplies 16,000 cubic feet of air a minute to the building—equivalent to 30 cubic feet of air a minute for each person—is located in the basement and is quite similar to that used on most conventional control stations but much smaller because only that quantity of outside air required for ventilation is handled by the control station apparatus.

The cost of air conditioning systems for tall buildings has been substantially reduced through elimination of large square ducts used

Continued on Page 24

OHMITE
STEPS UP PRODUCTION OF
Rheostats·Resistors·Tap Switches





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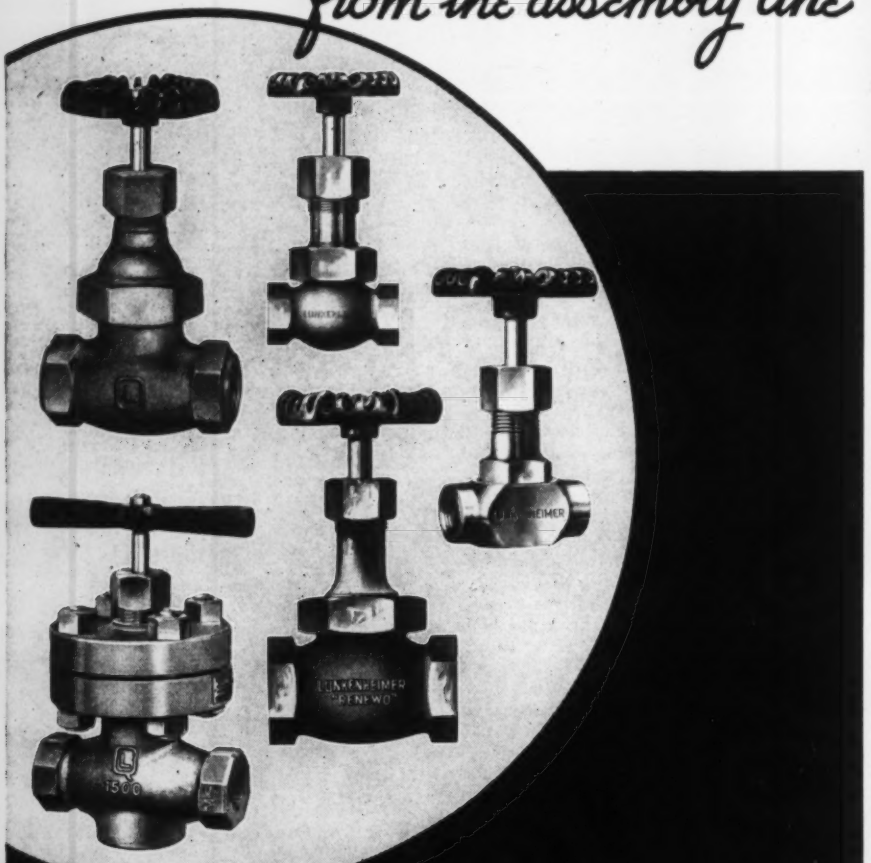
means uninterrupted production from the assembly line



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• Keep Informed

with present air conditioning installations, Mr. Murphy contends. The conduit system allows for conservation of materials and rentable building space, as well as economies in construction. By use of the smaller conduits, office space was saved in the United Carbon Company Building.

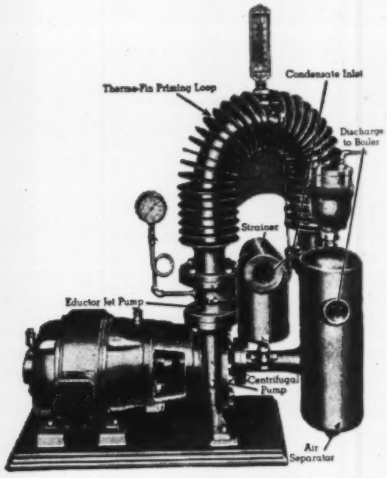
Complete standardization of parts has made it possible to achieve engineering and installation economies. The air risers, of which there is approximately one for each bay, are pre-fabricated in standardized diameters, the maximum for this 12-story building being six and one-half inches. They are cut to floor-to-floor length and welded together when assembled during construction of the building. There were 285 riser sections used in the United Carbon Co. installation.

The architect for the United Carbon Company Building is Walter F. Martens. Edward S. Tower was the Consulting Engineer, and Agston Construction Co. was the General Contractor.

High-Pressure Condensate Return System

The essential engineering features of the Cochrane-Becker high-pressure condensate return system, as announced by Cochrane Corp., Philadelphia, are that its eductor principle of operation insures thorough condensate and air removal from process apparatus making increased production possible by maintenance of uniformly high temperatures. Then, after expulsion of the air from the closed circuit, the condensate is returned to the boiler at temperatures close to that of process pressure without flash loss and with remarkable fuel savings.

The specially-designed centrifugal pump draws water from the thermo-fin priming loop and discharges it as a high velocity jet through the jet pump nozzle. This jet, striking the returned hot condensate, induces condensate flow through the mixing tube into the thermo-fin priming loop.



The additional volume of the returned condensate introduced into the constantly filled loop results in the discharge of an equal volume through the air separator to the boiler.

The closed circuit from the boiler, through the process equipment, and back to the boiler results in quicker and more uniform heating hence increased production and improved quality. At the same time flash loss is eliminated providing 1% fuel saving for each 11-degree temperature gain. Write Cochrane Corp. 3142 No. 17th Street, Philadelphia, Pa., for further technical information.

• Keep Informed . . .

• BUSINESS CHANGES

Lincoln Electric Co. Opens Jacksonville Office

The Lincoln Electric Co., world's largest manufacturer of arc welding equipment, Cleveland, Ohio, announces the opening of a new office in Jacksonville, Florida.

J. M. Chapple, who until recently was with the Detroit Office of the Company and who for $2\frac{1}{2}$ years was Managing Director of The Lincoln Electric Co. (Australia), Pty. Ltd., at Alexandria, will be in charge of the new branch.

Mr. Chapple has had wide experience in the welding industry, having been responsible, as Welding Development Engineer, for installing and developing the sales organization of the joint Armco-International-Lincoln Electric arc welding electrode factory in Buenos-Aires, Argentina. His experience includes 13 years association with the Armco International Corporation, most of the time in foreign service, and training in every department of the American Rolling Mills Company at Middletown, Ohio. This experience and training should prove of great assistance to firms in the Jacksonville area in applying electric welding for greatest advantage in their manufacturing, construction or maintenance operations, either in commercial work or production for National Defense.

The address of the Jacksonville Office for the present will be care of Union Terminal Warehouse, 700 East Union at Ionia.

• LATEST CATALOGS

Pease Calendar of Stars for 1942

Twelve beautiful motion picture stars from Columbia Pictures Studios glamorize the 1942 edition of the C. F. Pease Company's "Calendar of Stars." The radiance and beauty of such popular stars as Rita Hayworth, Barbara Stanwyck, Joan Bennett and nine other equally exquisite artists appearing in Columbia Pictures, make this original calendar outstanding. The new edition was designed especially for the C. F. Pease Company, 2623 West Irving Park Blvd., Chicago, Ill. Many of the photographs were posed for this calendar and each separate page has been arranged to accommodate the portrait.

There are twelve pages size $16'' \times 19\frac{3}{4}''$. A glamorous enlarged portrait of a different star covers the top half of each page. The lower half of the page contains the easy-to-read calendar of the current month, flanked by smaller ones of the previous month and the month to follow, and a modest illustration of a blueprinting machine or other Pease product. Mr. Wellington W. Brothers, advertising manager, reports that a heavy demand for copies may soon exhaust the present supply.

Second 1941 Edition of Quick Selector Catalog Issued

The second 1941 revision of the popular "Quick Selector" catalog is announced by Wemco. Issued twice a year, this 60-page catalog has found wide use because it simplifies the selection of electrical equipment for any motor, lighting, or feeder circuit.

Divided into 6 parts the scope of the catalog is as follows:

1. Safety switches—single and double throw with and without fuses.
2. Nofuse breakers—50 to 600 ampere frames for all types of locations.
3. Nofuse multibreakers.
4. Panelboards—Multibreaker, Deion, combination, plug-fuse, and fusible distribution types.
5. Motors—single phase, capacitor, two and three phase, standard, and gear motor types.
6. Motor control—Manual and magnetic with accessories.

Important changes in the new revision are the addition of industrial Multibreakers and the dropping of breaker enclosures made of aluminum. Included is new rule for applying safety switches on continuous duty circuits having constant loads.

Although all data has been brought up to date, the general form of the catalog has been retained. Electrical ratings, physical dimensions and circuit diagrams expedite the selection of correct equipment for each purpose.

A copy of "Quick Selector" catalog may be secured from department 7-N-20, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

Boiler Feed Water Treatment

Many modern high pressure plants today are using some type of supplementary treatment to improve their boiler operation. Judging from the great amount of interest in such equipment and from increased orders which The Permutit Co., 330 West 42nd St., New York, N. Y., have received for such units, they have realized the need for information on various types of chemical feeds.

Continued on Page 26

LARGE CAPACITY... in Small Space

De Laval-IMO Oil Pumps

for lube and fuel oil and for hydraulic pressure service pack great capacity into small space. The one shown, delivering 700 g.p.m., occupies only 30 in. square of floor space. It has only three moving parts and runs at standard motor or turbine speeds. Built in all capacities and for all pressures.

Ask for Catalog I-88

IMO PUMP DIVISION

of the De Laval Steam Turbine Co.

Trenton, New Jersey

When Machine Tools CHATTER . . . or Bearings and Gears run HOT— use "STURACO"

EXTREME PRESSURE ("EP") MACHINERY OILS & GREASES

STICKING ways resulting from overloads means troublesome "chatter." A STURACO ("EP") LUBRICANT will often eliminate the trouble for it has a technically accepted load carrying capacity of over 300% more than ordinary lubricants.

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Results from this unusual principle of lubrication have been astonishing. What is your tough problem? Write, wire or phone today!

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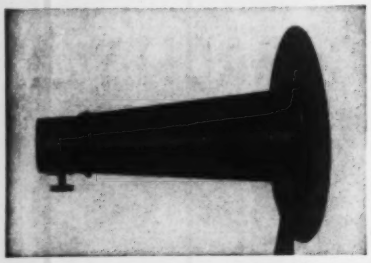

For either qualitative or quantitative photo-elastic analysis, perfection in the projection lens system is of major importance.

In our new model polariscopes of 4¼" & 6¼" clear aperture, the parallel beam is collected by a rear element and condensed through a three component lens of the Cooke system. In the new larger units (8¼" and 10" aperture) a four component lens of the Omnar system is used. In both cases, *the image is sharp throughout the field, free of aberration, astigmatism, and distortion.*

Literature of new model polariscope now available.

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RATE Announcements under this heading in MECHANICAL ENGINEERING are inserted at the flat rate of $1.25 a line per issue, $1.00 a line to A.S.M.E. members, minimum charge, three line basis. Uniform style set-up. Copy must be in hand not later than the 10th of the month preceding date of publication.

• Keep Informed . . .

Hence, they have recently issued a new publication—"Supplementary Treatment of Boiler Feedwater"—more informative than promotional in nature and which they feel presents a complete discussion of the various ways in which a plant might feed chemicals to further condition the water after external water treatment.

Industrial Control Devices

The Brown Instrument Co., Philadelphia, has just issued a new Catalog No. 8301—"Industrial Control Devices—Products of Minneapolis-Honeywell Regulator Co."

This new 56-page, large size, two color catalog is a comprehensive source of information for all interested in learning how production may be increased, costs lowered and product quality improved through the judicious use of automatic control of industrial processes.

It has been written to be readily understood by the engineer and layman alike. The first few pages of the book contain a primer of automatic control. The three classes of automatic control, i. e., electric, pneumatic and combined electric and pneumatic are fully described. Definitions of the various technical terms used in the descriptions are given.

Large, clear photographs illustrate forty-four industrial controls and safeguards such as temperature controllers, pressure controllers, humidity controllers, float switches, combustion safeguards, etc. Complete specifications and informative details are given for all types, covering what they are, why they are used, features, capacities, construction and operation.

Send for a copy of this catalog. Address: The Brown Instrument Company, 4486 Wayne Avenue, Philadelphia, Pa.

New G-E High-Voltage Starters

Publication GEA-3660, just issued by the General Electric Company, explains in detail the design, construction, and application of the new General Electric 2300-volt contactor motor starter which can be safely applied to high-capacity power circuits.

Well illustrated, the booklet tells how this contactor starter—designed for use with squirrel-cage, synchronous, and wound-rotor motors—can be applied on a highly repetitive duty cycle, and yet requires only a minimum of maintenance. The operation of the EJ-2 current-limiting fuses, which provide short-circuit protection, the overload relays for motor protection, and the cabinet enclosure housing the entire starter are also discussed.

Creep-stress Data on B&W Croloys

A new handy Technical Data Card listing the latest creep-stress data available on B&W Croloys and other tubular materials for high-temperature service, has been issued by The Babcock & Wilcox Tube Co.

For a copy, write The Babcock & Wilcox Tube Company, Beaver Falls, Pa. on your company letterhead. Ask for TDC-102-B.

Properties of Carbon and Alloy Steel Tubing

Technical Bulletin 6-D, "Properties of Carbon and Alloy Steel Tubing for High Temperature—High Pressure Service" has just been issued by The Babcock & Wilcox Tube Co., Beaver Falls, Pa.

This bulletin is a complete revision and enlargement of the previous edition and includes new data on physical properties and behavior in service of the B & W Croloys and other materials, resulting from the Company's research during the past three years. New sections have been added on the B & W Seamless-Tube manufacturing process, rupture testing, maximum allowable working stresses, steel for sub-zero application, effect of hydrogen, and air-hardening properties. The book also includes a fully illustrated section on common causes of tube failure. You may get this valuable technical bulletin by making request on your company letterhead or by otherwise indicating your company connection.

Fractional Horsepower Motors

Small motors from 1/6 to 1/2 horsepower, 145 frame size, for general use are described in a new eight-page folder announced by Westinghouse Electric and Manufacturing Company.

The standard parts making available more than 5000 combinations of type, rating, and mounting are described and illustrated. Charts show motor characteristics plotting per cent synchronous speed against per cent full load torque.

Features conducive to long motor life and low maintenance are discussed along with construction details. Thermoguard protection against overloads and excessive temperature is explained. Blackline drawings give the necessary physical and mounting dimensions.

A copy of folder F-8623 may be secured from department 7-N-20, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

COMING MEETINGS AND EXPOSITIONS

For the next three months

JANUARY

12–16	Society of Automotive Engineers, Annual Meeting, Book Cadillac Hotel, Detroit, Mich.
21–23	American Society of Civil Engineers, Hotel Waldorf-Astoria, New York
26–30	American Institute of Electrical Engineers, Winter Convention, Engineering Societies Building, New York
26–30	American Society of Heating and Ventilating Engineers, 48th Annual Meeting, Bellevue-Stratford Hotel, Philadelphia, Pa. and Seventh International Heating and Ventilating Exposition
28–30	Institute of Aeronautical Sciences, 10th Annual Meeting, Waldorf-Astoria Hotel and Columbia University, New York

FEBRUARY

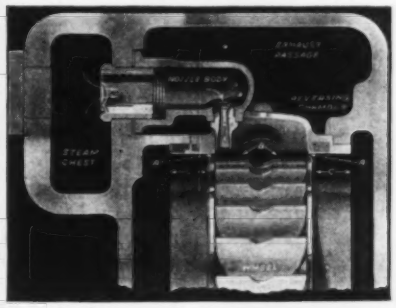
5–6	Engineering Institute of Canada, Annual General and General Professional Meetings, Windsor Hotel, Montreal, Canada
9–12	American Institute of Mining and Metallurgical Engineers, Annual Meeting, Engineering Societies Building, New York
16–19	Technical Association of Pulp and Paper Industry, Annual Meeting, Hotel Commodore, New York.

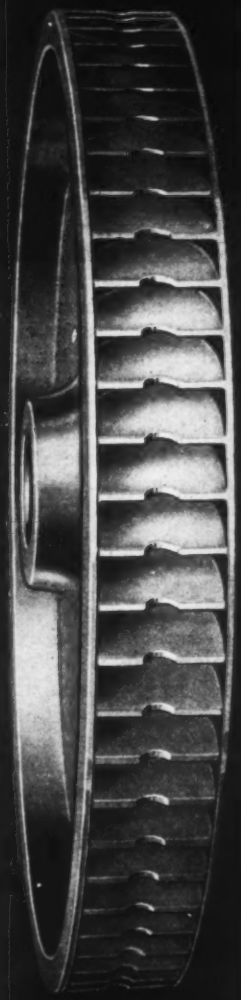
MARCH

2–6	American Society for Testing Materials, Spring Meeting, Cleveland, Ohio
3–6	Greater New York Safety Council, 13th Annual Safety Convention and Safety Equipment Exposition, Hotel Pennsylvania, New York, N. Y.
12–14	American Society of Tool Engineers, Annual Meeting, St. Louis, Mo.
23–25	The American Society of Mechanical Engineers, Spring Meeting, Rice Hotel, Houston, Texas

For Calendar of Coming A.S.M.E. Meetings see page 76 in the editorial section

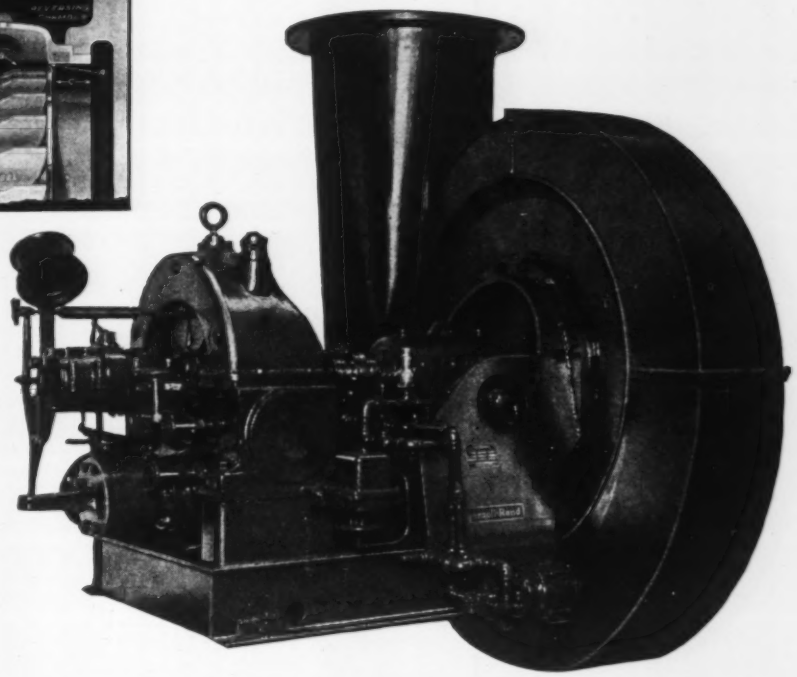
TERRY





ABOVE:
Terry Wheel Clearances. A-Rim Clearance. B-Large Blade Clearance. C-Side Clearance (about one inch)

AT RIGHT:
Typical Terry Solid Wheel Turbine direct connected to a blower.



THE BLADES ARE DOUBLE RIM PROTECTED
IN THE TERRY SOLID WHEEL TURBINE

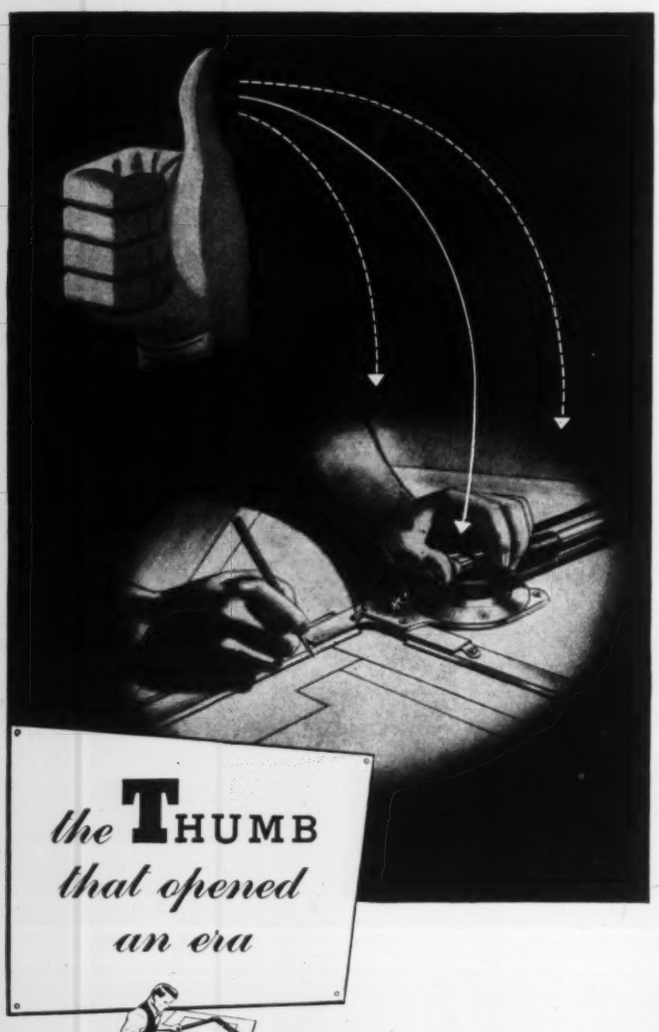
In the Terry Turbine the blades have large clearances and are further protected by the projecting rims at the sides of the wheel. These rims would take without damage any rubbing that might occur if the radial clearance became reduced.

End play can do no damage to the blading as the side clearance is very large (about one inch). There is no end thrust since the steam enters and leaves the wheel in a direction at right angles to the shaft.

The Terry solid wheel turbine is described in our Bulletin S-116. A request on your business letterhead will bring a copy.

T-1146

THE TERRY STEAM TURBINE COMPANY
TERRY SQUARE, HARTFORD, CONN.



A NEW ERA in swift, smooth drafting opened when Bruning did some serious research on the subject of making a draftsman's thumb more useful.

For that research resulted in the Bruning-Wallace Touch Control Drafter . . . embodying the "touch control" principle that brings new ease and simplicity to the drafting process. The control button, always under the draftsman's thumb, makes control of the protractor head practically automatic. No need to fumble for an inconvenient thumb latch—drafting costs are cut still further—drafting time reduced from one quarter to one half.

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The Standards COLUMN

News of Interest to Manufacturers

Surface Quality

IT will be recalled that in March, 1939 the proposed American Standard for Surface Roughness was printed and made available to industry for a two-year period of trial. This means that at the April, 1942 meeting of the Sectional Committee on the Classification and Designation of Surface Qualities, B46, steps will be taken to revise this tentative draft and to present it to the members of the sectional committee formally for final approval.

This project was authorized by the American Standards Association in March, 1932, and joint sponsorship assigned to the Society of Automotive Engineers and The American Society of Mechanical Engineers. Responding to the invitation of the sponsors, twenty-eight (28) national organizations indicated their interest in it and the organization meeting of the sectional committee was held on December 9, 1932

At the organization meeting five subcommittees were formed to prepare recommendations for surface standards in the fields indicated by their names: Subcommittee No. 1 on Standardization of Surfaces produced by Tools and Abrasives; Subcommittee No. 2 on Standardization of Surfaces produced by Molds, Dies, Rolls or any Other Means of Deforming Materials; Subcommittee No. 3 on Standardization of Coated Surfaces; Subcommittee No. 4 on Symbols for Indicating Surface Quality on Drawings; and Subcommittee No. 5 on Ways, Means and Apparatus for Measuring Quality of Surface.

When, at its December 1, 1936 meeting, Subcommittee No. 5 found this type of organization was not producing the results greatly desired by industry, it recommended to the sectional committee that these five subcommittees be discharged and an Executive Committee be appointed consisting of the following eight men: Messrs. J. R. Weaver, chairman, H. J. Wills, secretary, E. H. Berges, U. S. Eberhardt, R. F. Gagg, R. E. W. Harrison, H. F. Kurtz, and S. McMullan. This recommendation found acceptance among the members of the sectional committee and the executive committee was duly appointed.

The executive committee held meetings at New York in April, 1937; at Detroit in May, 1937; at Washington, D. C., in July, 1937; at Niagara Falls in September, 1937; and the first tentative draft of the proposed standard was completed in October, 1937. This draft was reviewed at the December, 1937 meeting of Sectional Committee B46 and was revised in accordance with suggestions made at that time. A second draft of the proposal, containing nomenclature and definitions and an explanatory appendix was distributed to industry for criticism and comment in May and June, 1938. Much credit for the completion of this part of the project is due to James R. Weaver who served very acceptably as chairman of the executive committee.

For further information—address

The American Society of Mechanical Engineers
29 West 39th St., New York, N. Y.

• Keep Informed . . .

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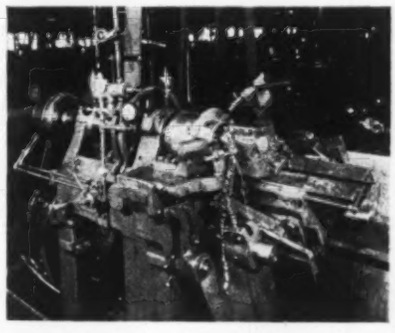
- *NEW EQUIPMENT*
- *BUSINESS CHANGES*
- *LATEST CATALOGS*

Available literature may be secured by addressing a request to the Advertising Department of MECHANICAL ENGINEERING or by writing direct to the manufacturer and mentioning MECHANICAL ENGINEERING as a source.

• NEW EQUIPMENT

Timken Converts Single Spindle Automatics to Meet Emergency

The Timken Roller Bearing Co., Canton, Ohio, was recently confronted with the problem of speeding up production of 3¼" to 10" O.D. bearings for tanks and trucks. The machines capable of handling these sizes were working at full capacity while at the same time drastic curtailment of passenger car production had thrown forty of the smaller automatic machines out of production. These had a maximum size capacity of 3¼" O.D.



The obvious solution to this problem, under normal conditions, would be the purchase of new machine tools. However, since new tools were not available, the only other solution was to retool the smaller machines to accommodate sizes up to 8" in diameter. Timken engineers discovered that the 40 single spindle machines could be made to do all the forming operations, but they were incapable of handling the cut-off of the larger tubes. So twenty heavy-duty single spindle automatics which had been producing completed parts were set aside to make slugs for the smaller machines.

The conversion involved the removal of the old feeding and chucking mechanisms. The spindles were then equipped with three-jaw, adjustable air-operated chucks as shown in the center of the illustration. A taper attachment (shown in the foreground) was constructed so as to turn either the tapered O.D. or bore the I.D. All bearings were replaced and the machines were thoroughly overhauled.

Production proceeds through three steps. (1) Slugs are cut on the larger machines. (2) O.D. is turned on a converted air chucking machine, and (3) I.D. is bored on a second converted air chucking machine.

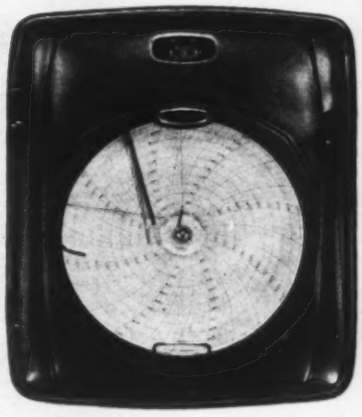
Despite the fact that the three operations are performed on three separate machines, the forty converted air chucking machines plus the twenty heavy duty automatics involved in these three operations put out as many finished pieces as 80 heavy duty automatics are capable of producing in a given time.

The first consideration in this conversion program was to meet the increased demand for more of the larger product at any cost. Second in importance was the utilization of unadapted equipment.

The third consideration was cost. Naturally, the parceling out of operations among three different machines entails a cost increase, but this increase is surprisingly small.

New Foxboro Model 30 Stabilog Controller

When The Foxboro Co., introduced the Stabilog Controller, it was featured as the first instrument providing full proportional control with automatic reset of the control point. Many thousands of installations have since been made, in applications involving control of temperature, pressure, liquid level, or flow; and it is an impressive fact that in more than ten years of this field experience, no changes have been found necessary in the fundamental principles of operation. In introducing the new Model 30 Stabilog Controller, now, Foxboro emphasizes the fact that the new features are principally refinements, for better appearance and still closer control, but that the Model 30 does not depart from the tested and proven Stabilog Control principles.



The Model 30 appears in the new universal rectangular case, which combines practical convenience with attractive appearance. When panel-mounted, the instrument extends only ¾ inch from the panel surface. The door is recessed; hinges and hasp are flush with the door surface. A dual pressure indicator, replacing the customary two small gauges, is easily seen through a rectangular opening in the door. Interior illumination is readily provided when desired.

All operating adjustments are made from the front of the case, the adjusting mechanisms for change of control point, throttling range, and reset resistance being immediately accessible when the door is opened. But the entire operating mechanism is protected and concealed behind a removable plate. Unit construction simplifies replacement of the measuring system, changing the type of control, or any other major servicing of the mechanism that may ever be necessary.

Operating features of the new Stabilog Controller are described in connection with the instrument's three functions: the first is its proportional function, providing uniform pneumatic proportional action, adjusted to the smallest value that will result in stabilization following a disturbance of process conditions. The reset function, the secondary adjustable controlling function, acts simultaneously with the proportional function, establishing stabilization at the desired point of control. The third function provides a temporary additional correction, determined by the rate of change in any disturbance of conditions. If the rate of change is fast the additional correction is large; if the rate of change is slow the additional correction is negligible. The operation of this third function is entirely automatic, being governed by the proportional and reset adjustments.

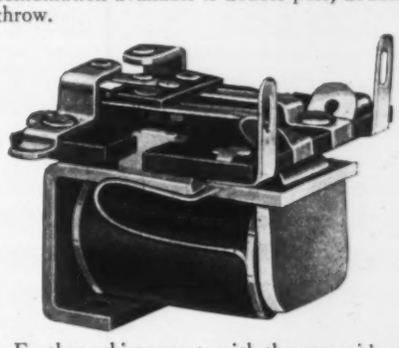
Recording and Indicating Model 30 Controllers are illustrated and described in Bulletin A-252 which will be sent on request. Address The Foxboro Co., Foxboro, Mass.

New Midget Relay

Designed to provide maximum control in minimum space, with the many unique needs of National Defense in mind, Guardian Electric announces its new Series 195 DC Midget Relay.

Particularly suited to aircraft and radio work, the small size and light weight of this midget relay are said to be the outstanding features which have caused numerous aircraft and radio contractors for National Defense to accept the new midget relay as the answer to a long-felt need, according to the manufacturer. Although reduced in size and weight compared to other Guardian midget relays, an equal if not superior degree of performance is claimed for the new unit.

Maximum contact capacity of the Series 195 Midget Relay is approximately 150 watts, measured at 110 volt, 60 cycle, non-inductive AC. The manufacturer reports that in a number of present aircraft applications, the contacts on the new midget are making and breaking 3 non-inductive amperes at 28 volts DC. Maximum contact combination available is double pole, double throw.



Further achievements with the new midget relay are claimed as follows: With a 2 watt coil, and single pole, double throw contacts in the de-energized position, the normally closed contacts withstand vibrations of six times gravity (6 G's); the normally open contacts withstanding 10 G's. In the energized position, the contacts withstand 10 G's.

Relay coil in the new Series 195 Midget Relay is available for any voltage up to 75 volts DC—maximum resistance 3000 ohms—

Continued on Page 23

Chrome-moly steels speed production and lower costs

A manufacturer of speed reduction gear pinions is taking advantage of two of the outstanding advantages of Chromium-Molybdenum (4140) steel — uniform hardening in heavy section, and excellent machinability at intermediate hardnesses.

Pinion and shaft are machined integral from a 4140 round oil quenched and tempered to about 150,000 p.s.i. tensile and 300 B.H.N.

Uniformity in hardness of the heat treated bar assures adequate strength in the shaft even though its diameter is only about half that of the pinion. This integral construction eliminates an assembly operation and makes for better performance.

Send for our free technical book, "Molybdenum in Steel". It contains helpful data on Molybdenum steels that may be of assistance in your own problems.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.
MOLYBDIC OXIDE — BRIQUETTED OR CANNED • FERROMOLYBDENUM • CALCIUM MOLYBDATE

Climax Molybdenum Company
500 Fifth Avenue New York City

MOLY

average power requirements of the coil being 2.5 watts.

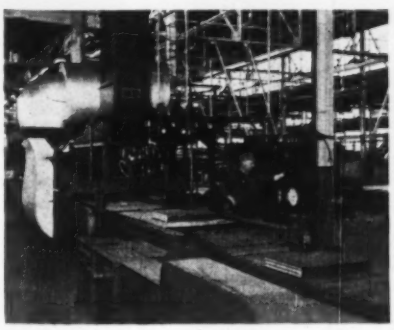
Simply and sturdily constructed throughout, a light armature operates the contacts which are mounted on and insulated (900 Hi-Pot. Test) from the field piece, through a direct lever action. Coil and contact terminals are solder lug type, tinned for easy soldering. Contact blades are tinned phosphor bronze with contact points of fine silver. Field piece and armature are annealed magnetic iron. Coil is varnish impregnated and baked. Weight with single pole, double throw contacts is .85 oz. Bulletin showing coil resistances, various mounting possibilities and dimensions, is available by writing to the manufacturer, Guardian Electric, Dept. 195, 1619 West Walnut Street, Chicago, Ill.

Increases Corrosion-Resisting Valve Capacity

Jenkins Bros., manufacturer of valves, announces that it has materially increased productive capacity of Corrosion-Resisting Alloy Valves. This puts the company in the position of offering faster delivery on these valves for orders having high priority ratings. The line of Globe, Angle, Y and Check Valves has been augmented by Solid Wedge and Double Disc-Taper Seat Gates in sizes to 6". Another innovation is "Certified Castings," each casting being x-rayed as well as pressure-tested. Descriptive booklet "SS" is offered. Jenkins Bros., 80 White Street, New York, N. Y.

Complicated Soldering Done Automatically

An automobile radiator looks like an intricate maze of copper tubes and fins—requiring a countless number of soldered joints. This complicated soldering job is now done automatically instead of by hand. The assembly of copper tubes, fins, and solder are placed in position on this electrically operated conveyor in the plant of the Fedders Manufacturing Co. of Owasso, Michigan.



The conveyor, a product of Mechanica Handling Systems, Detroit, then takes over the job. First the assembly passes through a flux spray and then on into an oven. The oven-heating cycle is operated in synchronism with the conveyor movement using electrical controls developed by the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa. After a fixed time in the oven, long enough to bring the solder to a flow point, the conveyor starts again and moves the radiator core into a press, where it is held flat and square while an air blast cooks it and solidifies the solder. This air blast is also controlled automatically in time with the conveyor and press movement. After the ore is sufficiently cooled, the press opens and places the core again on the conveyor, which delivers the finished core at the discharge end.

The entire operation of the oven is automatic, likewise the entire operation of the press and both are controlled in sequence with the intermittent movement of the conveyor. This shows very well what can be done in the way of developing an automatic system for process machinery where several operations are tied together by a handling system, thereby making a large automatic machine out of several manually operated ones.

Electric Eyes Control Calibration Load

Electric eyes continue to assume new seeing jobs. They now act as a watt-load regulator for meter calibration at the Westinghouse meter division, Newark, N. J.

A tiny mirror is fastened to the end of the precision meter standard needle. A beam of light is reflected from this mirror to a pair of photo cells. As long as the load is constant, the light falls between the electric eyes and they take no action. Should the load change for any reason, ever so slightly, the light swings to one tube or the other. This tube, acting through an electronic amplifier, makes the correction in load. By this means the precision meter not only indicates the load, but regulates it as well.

This scheme is particularly useful now that thermal-type meters are coming into vogue. These require a comparison with a standard over a period of several hours. The standard can be set to a fixed load and left, say overnight, with no further attention with the assurance that the load will not indulge meanwhile in any peregrinations.

The scheme, applied thus far only to meters calibrated with a Kelvin-type standard, can be applied equally well to other jobs where volts, amperes, power factor, frequency, or even mechanical quantities must be held constant.

Kropp Forge Awarded Navy's Ordnance Flag and "E" Pennant

The Kropp Forge Co., 5301 W. Roosevelt Rd., Chicago, Ill., makers of steam hammer, drop and upset forgings, has been awarded the U. S. Navy Ordnance Flag and the Navy's blue pennant imposed upon which is a white "E" that stands for Excellente.

The company, founded in 1837, is among the very few suppliers of parts to have this honor bestowed upon them since it is customarily awarded only to those firms supplying finished equipment to the government.

Approximately 96% of the company's forging capacity has been set aside for National Defense.

Ceremonies to commemorate the award and dedication of the Navy flags will be announced at a later date.

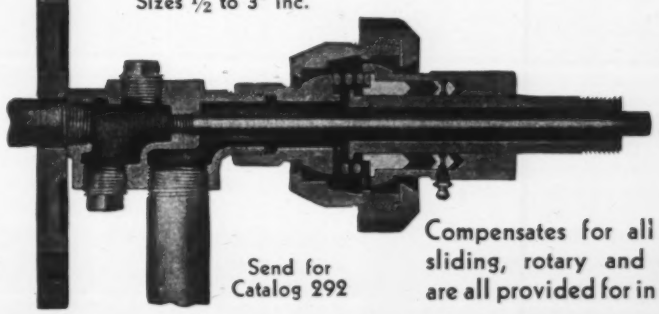
Continued on Page 24

BARCO REVOLVING JOINTS

Sizes ½ to 3" inc.

For heating or cooling of all types of Rolls and Drums.

Adaptable to cooling of cold steel mill rolls.



Flexibility All Directions

Send for Catalog 292

Compensates for all movement, sliding, rotary and eccentricity are all provided for in these joints.

BARCO MANUFACTURING CO.
NOT INC.
1807 Winnemac Ave., CHICAGO, ILL.
In Canada—The Holden Co. Ltd.

Write for Catalog

Having trouble with loose bolted fastenings?

Try Elastic Stop Nuts . . . they are not only self-locking, they hold fast with a resilient grip that cannot be loosened by vibration, shock, or prolonged hard service. *Samples for testing will be furnished without charge.*

CATALOG contains a graphic explanation of the Elastic Stop principle, presents test and application data, and lists the complete line of nuts. • **Write for a copy.**

ELASTIC STOP NUT CORPORATION
2375 VAUXHALL ROAD • UNION, NEW JERSEY

Elastic Stop SELF-LOCKING NUTS

• Keep Informed . . .

General Electric Equips New Steel Foundry Laboratory

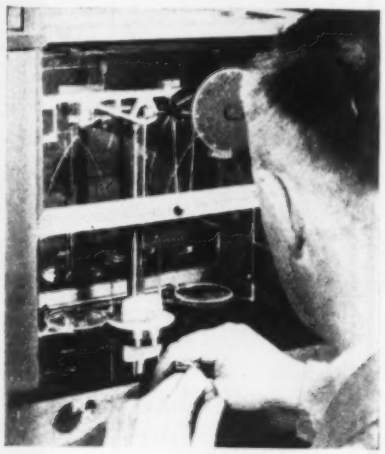
A new steel foundry laboratory equipped with the most modern apparatus is the latest answer of the General Electric Co., Schenectady, N. Y., to defense production problems.

Secluded in the fluorescent-lighted brick structure adjacent to the foundry, Gerald Zeh and Newton Sax, metallurgical chemists, are prepared to furnish foundry men with a preliminary quantitative analysis of a steel sample within one-half hour after it has been removed from the foundry furnace.

This determines the amount of carbon, manganese, and molybdenum present and the quantities that must be added to the molten metal in the furnace to produce an alloy with the desired characteristics. Subsequent analyses determine the amount of other elements present, such as silicon, sulphur, phosphorus, chromium, and nickel.

Three small electric furnaces with vacuum-tube controls are available for gravometric determination of the amount of carbon in a sample. The sample is heated and oxygen passed over it. The subsequent chemical reaction produces a deposit of sodium carbonate in a test tube containing a known weight of caustic soda, or sodium hydroxide. The amount of carbon that was present in the sample is indicated by the increase in the weight of the test tube.

A titration table, equipped with a battery of pressure-fed burettes, or long, graduated glass tubes, is used to determine the quantities of other elements present that can be analyzed volumetrically. Solutions made from the samples are mixed with control solutions until certain color changes occur. The amount of control solution that was added indicates the quantity of the element present. A daylight fluorescent screen behind the titration table facilitates color comparisons and burette-scale readings.



Accurate weighing also is important in steel analysis. Balances, accurate to within one three-hundred thousandth of an ounce and capable of giving indirect readings to within one three-millionth of an ounce, are mounted on a slate-covered vibration-proof concrete pier separated from the buildings. This pier is sunk four feet into the ground into the center of the laboratory and is surrounded by cork board that serves as a shock absorber.

Tanked oxygen and piped city gas, compressed air, vacuum, steam, and water are available at the turn of a faucet or thumbscrew. As many as 145 quantitative analyses have been run by Mr. Zeh and Mr. Sax in a 24-hour stretch.

83-Mile Defense Pipe Line Arc Welded in 30 Days

A new 83-mile, $10^{3}/_{4}$-inch National Defense pipe line to relieve the Pacific Coast tanker shortage by transporting oil from Ventura to Wilmington (Los Angeles), California, for production of vitally-needed high-test aviation gasoline was just recently completed in the record time of 30 days by use of arc welded construction. Illustration shows the last joint being welded by Sidney Belither, Board Chairman of Shell Oil Co., the owner.

Built for the Shell Oil Co. by the Macco Robertson Construction Co. of Clearwater at a cost of $2,000,000 the line was "stove-piped," every joint being individually arc welded. Joints were welded in three beads by the shielded-arc process using equipment supplied by The Lincoln Electric Co., Coit Road and Kirby Ave., Cleveland, Ohio. Six of the engine-driven welding machines used were Lincoln's new diesel-powered units.

There were 435,000 feet of pipe weighing 9000 tons. An average of 12,500 feet of pipe were laid daily, indicating the speed possible with welded construction.

WHEN HEAVY LOADS CAUSE Machine Tool Chatter or Hot Bearings and Gears

USE "STURACO" ★★★★ EXTREME PRESSURE ("EP") MACHINERY OILS & GREASES

• Here is the answer to many of your lubrication problems caused by today's production demand of heavy loads, high speeds, and continuous operation of machinery and machine tools. "Sturaco" EP Oils and Greases, without any change in your accustomed viscosity or consistency, offer a minimum of *300% increased load carrying capacity* with notable low torque.

Lubrication of ways — spindle bearings — gear heads — elevating screws — speed reducers — are typical examples where "Sturaco" application has solved tough lubrication problems. If you need help, write or phone today.

• • •

SEND FOR the new "Sturaco" booklet outlining laboratory research behind this genuine development, describing typical applications and listing various grades.

For All Cutting Fluid Problems
D. A. STUART OIL CO.
Chicago, U.S.A. • LIMITED • Est. 1865
Warehouses in All Principal Metal Working Centers

• Keep Informed

Extreme hilly terrain—the line is through the Santa Monica mountains at an elevation varying between 950 feet and 1700 feet—required bending the pipes over hills, around bends and into valleys. Slopes of 60 degrees were not unusual. Bending was done with the pipe cold, but in many instances, with the weld still warm, attesting the strength of the welded joint.

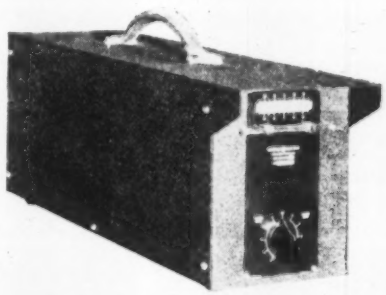
The new line will deliver 22,000 barrels of oil daily to the Wilmington refinery of Shell Oil Co. and increases the company's expenditures in California pipe lines to $12,000,000.

New A-C Addition to Electrifugal Pump Line

Adding to its line of recently introduced Electrifugal single-unit pumps, Allis-Chalmers Manufacturing Co., Milwaukee, announces a new 25-horsepower unit. Like the other smaller sizes in the line, the new pump is built as one unit, with both motor and pump on one shaft and in one housing. This design offers many advantages, among which are a 33% saving in space, only three section-fits as compared to five or more for old style pumps, more perfect shaft alignment, less vibration, less wear, easier installation, lower pumping costs. The addition of the new unit to the line now makes available a full range of sizes and types in the Electrifugal line from $\frac{1}{2}$ hp to 25 hp.

New Magnetic Oscilloscope Announced by General Electric

A new peak-reading portable instrument, the magnetic oscilloscope, has been announced by the General Electric Co., Schenectady, N. Y. Developed primarily for use in resistance welding, it may be applied as a supplement to other instruments used in trouble-shooting and in making installation adjustment.



Among the oscilloscope's varied uses in the field of resistance welding are: checking operation of electronic controls; adjustment of starting angle of control to correspond with power-factor angle of welding machines; adjustment of full-wave setting on control of phase-controlled welding machines to correspond with 100 per cent "heat" of control dial; current measurement (full wave only) for very short "on" intervals; voltage regulation measurements; observation and measurement of magnitude of starting transients on nonsynchronous welding control; and current measurements made with pointer-stop instruments.

The oscilloscope has a high-speed response to both current and voltage, made possible by the use of a permanent-magnet type of oscillograph galvanometer. Magnitude, symmetry, and uniformity of current wave are revealed quickly by the length, position, and uniformity of a horizontal trace of light on the ground-glass viewing screen. A narrow light beam from an internal lamp impinges upon the tiny galvanometer mirror, the movements of which are reflected to the

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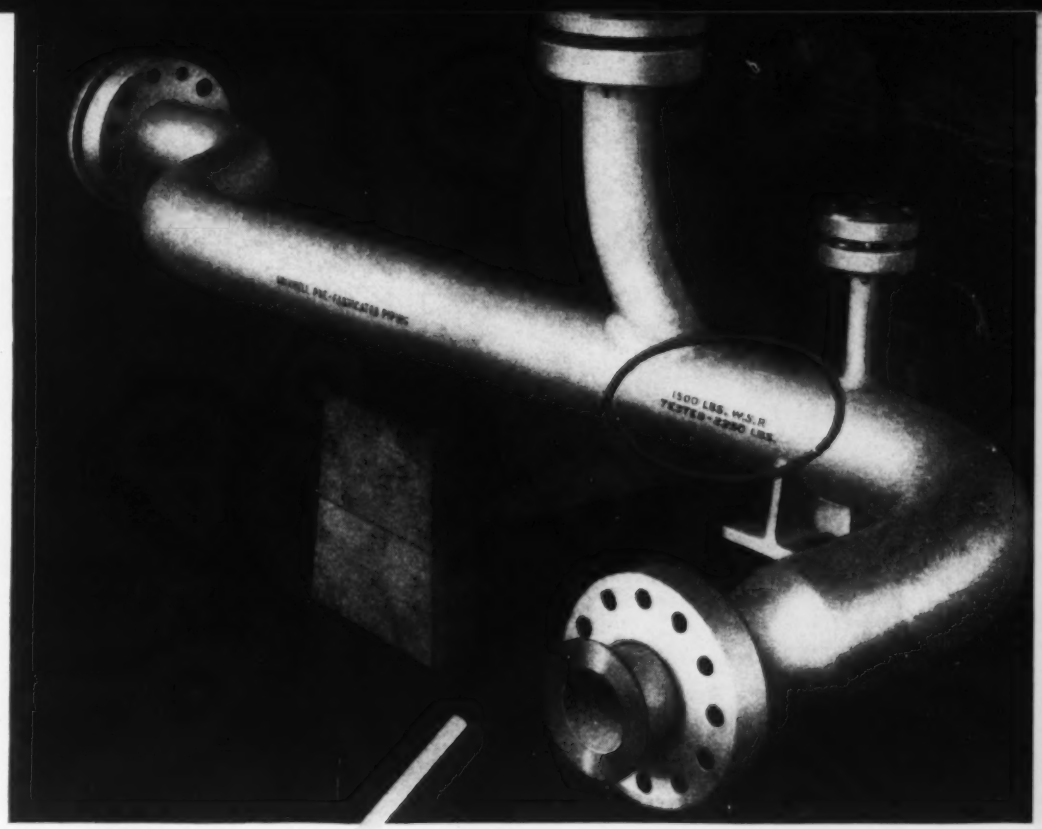


Not as Different as You Think!

This piece of Grinnell Prefabricated Piping and the barrel of a high power rifle both have to take the terrific punishment of extremely high pressures.

90° bends, curved angle nozzle, lap joint, integral swedged reducer—practically everything that can be done with a piece of pipe is represented in this piece which successfully passed every test under pressure of *more than one ton per square inch!*

Making a piece of piping to specifications like that is a large order, but it is an order that Grinnell takes in its stride. For Grinnell is equipped to interpret any piping requirement and prefabricate the piping accordingly.

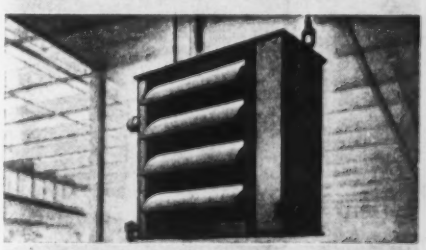
When piping is involved, simply *"Give the plans to Grinnell"*. Grinnell Company, Inc. Executive Offices, Providence, R. I. Branch offices in principal cities.

GRINNELL

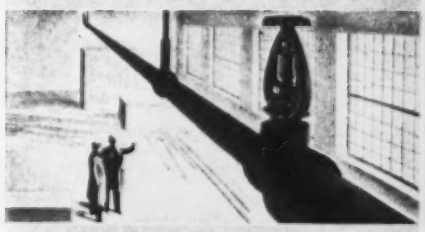
WHENEVER PIPING IS USED FOR DEFENSE

Grinnell Company, Inc. . . Grinnell Company of the Pacific . . Grinnell Company of Canada, Ltd. . . General Fire Extinguisher Company . . American Moistening Company . . Columbia Malleable Castings Corporation

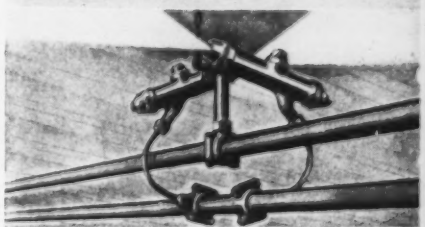
Grinnell Pipe Fittings make stronger, tighter pipe connections . . .



Grinnell Thermoliers provide heat when and where it's wanted at lowest cost . . .



Grinnell Automatic Sprinklers guard against fire, and husband precious defense efforts . . .



AMCO Humidification Systems aid

• Keep Informed

viewing screen. The instrument requires no reset time—a quick change from potential to current measurement is accomplished by turning a switch on the front of the box. The instrument is almost entirely free from magnetic field interference.

The magnetic oscilloscope weighs approximately 14 lb, is 7 inches high, 6 inches wide, and 17 inches long. It operates from 110–120-volt, 60-cycle current, using 25 watts. A connecting lead with attaching plug is furnished with each instrument.

Heavy-Duty Water Column Try-Cocks

The new Y.H.D. (Yarway Heavy-duty) Try-cock manufactured by Yarnall-Waring Co., Chestnut Hill, Philadelphia, makers of the Yarway Hi-lo Alarm Water Column for steam boilers is now available. Built for modern high-pressure service, Y.H.D. Try-cocks are easy to operate and they shut off tight—no dripping. For pressures up to 600 lbs., body and stem are tobin bronze; for 600 to 1500 lbs., these parts are stainless steel. Shanks are stainless steel. Needle valve and seat are stainless steel, heat-treated; these parts reversible and renewable. To avoid interference of operating chains, the operating lever on upper try-cock is offset outward, lever on center try-cock is straight and lever on lower try-cock is off-set inward. Y.H.D. Try-cocks are also made in weighted lever style with single operating chains. Complete description in Yarway Catalog WG-1808.

Latest Carrier Installation

Syracuse, N. Y.—The outside weather will not hinder the brain and paper work of the OPM and other government agencies located in the new Social Security Building, at Washington, D. C., in their all-important jobs of speeding this country's war efforts.

Seven Carrier Centrifugal refrigerating machines, each of 600 ton capacity, can produce cooling equivalent to the melting of 4,200 tons of ice every day.

An idea of the immensity of this installation can be gained from the fact that in the seven refrigerating machines there are 10,000 tubes equal to approximately 25 miles of tubing. The surface of this tubing would cover $1\frac{1}{2}$ acres.

There are 11 million gallons of water per day chilled by the centrifugal machines and circulated through the air conditioning system. Eighteen million gallons of water per day flow through the refrigerant condenser system. The total water circulated and reused is sufficient for the average daily needs of a city of 200,000 population.

This latest installation brings the total of Carrier Centrifugal Machines in operation in Washington to 55. The combined capacity of these machines amounts to the equivalent of melting more than 34 million pounds of ice per day.

• BUSINESS CHANGES

International Nickel Detroit Office Moves

In cooperation with other tenants who have consolidated their office facilities in the General Motors Building in Detroit, due to increased defense activities, The International Nickel Co., Inc., announces the moving, as of January 1, 1942, of the Detroit office of its Development and Research Division from the tenth floor, Room 10-227, to the eighth floor, Room 8-217, of the same building. The telephone number remains the same.

Fire Extinguisher Company . . American Moistening Company . . Columbia Malleable Castings Corporation . . The Ontario Malleable Iron Company, Ltd.

AMCO Humidification Systems aid textile industries speed deliveries of uniforms, parachutes and other defense

• Keep Informed . . .

T. I. Phillips Elected Vice President of Westinghouse

Election of T. I. Phillips as a vice president of the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., was announced after a recent board meeting by A. W. Robertson, Chairman. Mr. Phillips started with the Company as a tool maker in 1915 and has been assistant to the president of the Company since February 14 of this year.

A native of London, England, Mr. Phillips was educated in public schools of Lynn, Mass., attended evening school and took a course of apprentice training to fit himself for the job of tool maker. Within a year after joining the Company, Mr. Phillips was made a foreman. One of this early accomplishments was his work on tooling and equipment at the Chicopee Falls, Mass., plant. This brought recognition and he was transferred to East Pittsburgh in 1919 for time study work in the railway department and the copper mill.

Mr. Phillips later became general foreman of the tool department, assistant chief inspector of the East Pittsburgh works and superintendent of the metal stampings department. He reorganized and equipped the metal stampings plant, installing battery presses for punchings used in industrial motors, a forward step in factory practice.

In 1930, Mr. Phillips was appointed manager of the works department at the Nuttall plant of the Company, where he equipped the gearing department with improved and highly accurate machines. Increased accuracy in production was gained, with more quiet operation and longer life of gear equipment. Three years later, Mr. Phillips was made works manager for the Company, to serve as control authority for all manufacturing operation. His appointment as assistant to the president, in charge of a headquarters manufacturing staff and supervision of several important divisions of the Company, was made last February.

Tall and gray-haired, Mr. Phillips is known to his associates as a soft-spoken but forceful executive, with great capacity for managing men and an intimate personal acquaintance with the intricate manufacturing processes which he now supervises. The broad of directors in 1937 awarded him the Order of Merit, a means of recognition for special accomplishment. With it went a large bronze medal and a citation for his broad understanding of the technical and human problems of management; for his wisdom in matters of employe relationship; and for his keen sense of justice and his thorough understanding of manufacturing technique.

Harrington Appointed Manager Sales General Electric, Schenectady, Induction Motor Section

Elliott Harrington, for the past year sales manager of the General Electric air conditioning and commercial refrigeration department at Bloomfield, N. J., has been named manager sales of the Schenectady induction motor section of the G-E motor division. The appointment is effective today, according to an announcement by C. F. Pittman, manager of the motor division of the company's industrial department.

Mr. Harrington has been connected with G-E air conditioning and automatic heating activities from their inception about 10 years ago. His early assignments on the development of an automatic oil furnace led directly to the formation of the air conditioning and commercial refrigeration department, in which he served in various engineering and sales capacities.

A native of Delavan, Wisconsin, Mr. Harrington was graduated from Beloit College in 1916, and did post-graduate work in engineering at Massachusetts Institute of Technology and in business administration at Harvard.

During World War I, Mr. Harrington entered the U. S. Naval Air Service, serving 18 months as a pilot and on the development of an aerial bombsight, and acting as officer in charge of aerial gunnery and bombing at North Island air station in San Diego.

He entered the General Electric "test" course at Schenectady in 1919, and until 1926 was engaged in the industrial engineering and industrial control engineering departments. Assigned to investigate the oil burner field for possibilities in the manufacture of electrical control, he reported that the entire burner offered an opportunity to the company. His first project was the development of the automatic oil furnace, which represented an entirely new conception of oil heating equipment, and on this he worked at first alone and later with others.

In 1931 began the development of other devices, for humidifying, cooling, and cir-

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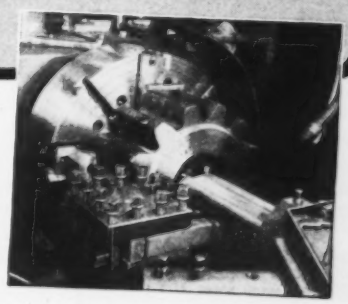
Interrupted Cuts

NEED NOT WORRY YOU



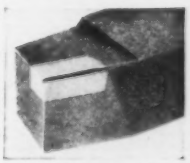
IF YOU USE

KENNAMETAL

The *Stronger*

STEEL-CUTTING CARBIDE

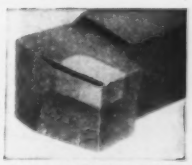
Not so very long ago, tool engineers hesitated to use carbide tools on any job which savored of interrupted cuts. The introduction of KENNAMETAL, however, completely reversed their opinion, for the greater strength and elasticity of KENNAMETAL with suitable tool angles permitted its use on interrupted or jump cuts without tool breakage. In the job illustrated, for example, a cast steel rack pinion is turned, faced, and bored over interruptions and sand holes at 155 ft. per min. using KENNAMETAL grade KM tools. Production was increased 5 to 1 as compared to high speed steel tools.



Style 11 Turning Tool

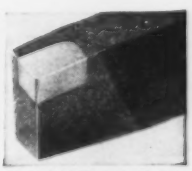
Record Sales Permit Price Reductions

You need pay no extra to use the *best* steel-cutting carbide tools—KENNAMETAL costs no more than other carbides. Send for our new Price List No. 7 containing new low prices on KENNAMETAL tools and blanks, effective Jan. 5, 1942. Do you have our new Catalog No. 42?



Style 21 Facing Tool

SALES REPRESENTATIVES FROM COAST TO COAST

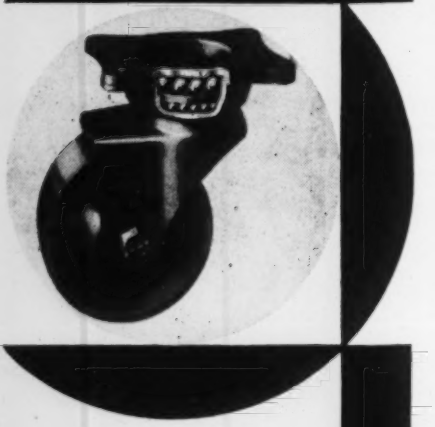


Style 19 Shaper Tool

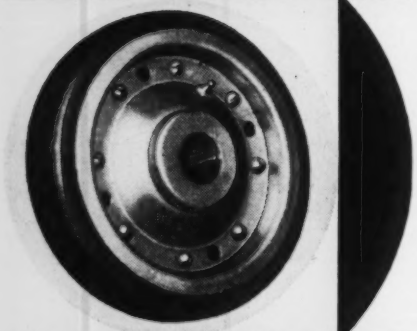
Canadian Agent: KENNAMETAL TOOLS & MFG. CO., LTD., Hamilton, Ont.

Be Right with

DARNELL CASTERS & WHEELS



Maximum Floor Protection
Increased Employee Efficiency
Longer Service for Equipment



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Fully describes nearly 4000 types of casters & wheels

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LONG BEACH, CALIF.
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60 WALKER ST., NEW YORK

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culating air as well as heating it, and in 1932 General Electric established its air conditioning department, with Mr. Harrington as commercial engineer. At Schenectady he and his family lived in a "proving home" through which thousands of visitors were shown continually. Walls were torn out and fitted with air ducts. Oil furnaces, air conditioning units, and indicating devices were installed, and family and visitors made progress through the rooms by dodging thermocouples which dangled from the ceilings.

The department was later moved to Bloomfield, and Mr. Harrington was in charge of all application engineering and cooling equipment sales. With the consolidation, in 1940, of the company's commercial refrigeration activities, he became western sales manager. He held that post until his appointment, early in 1941, as sales manager of the G-E air conditioning and commercial refrigeration department at Bloomfield.

Cochrane Corporation Adds Lundrigan

Ralph J. Lundrigan has joined the Cochrane Corp., 3142 N. 17th St., Philadelphia, Pa., to supervise the merchandising of the new Cochrane-Becker high-pressure condensate return system.

As production manager for a combination of New York, Ohio, and Michigan food manufacturers. Mr. Lundrigan became keenly interested in steam process operations. With the past six years devoted to the sale and development of installation technique best-suited to the Cochrane-Becker system, the practical problems which it is designed to solve are no strangers to him.

DE LAVAL-IMO OIL PUMPS on Combustion Control

Hydraulic pressure oil to the combustion controls of the 2400 pound boilers in the Twin Branch Power Station of the Indiana & Michigan Electric Co. is supplied by these two De Laval-IMO oil pumps. This Station also has two other De Laval-IMOs for oil burner service, as well as De Laval centrifugal condensate, booster and hot well pumps.

Write for Publication I-89.

IMO MOVE OIL

IMO PUMP DIVISION of the De Laval Steam Turbine Co. Trenton, New Jersey

Inco Makes Promotions

Three new assistants to J. F. McNamara, Monel Sales Manager, have been announced by The International Nickel Company. They are W. J. Calnan, H. D. Tietz, and E. A. Turner. At the same time H. E. Searle, formerly an assistant to Mr. McNamara as Manager, Engineering Sales, for the Monel Department, has been transferred to the Nickel Sales Department under R. L. Suhl, Sales Manager.

The titles of Manager, Engineering Sales, and of Manager, Sales Promotion, the latter held by H. D. Tietz, have been abolished. Each of the new appointees will be Assistant to the Sales Manager.

C. J. Bianowicz becomes head of the Chemical Section of Monel Sales to succeed E. A. Turner.

Johns-Manville Sponsors Radio Program

Johns-Manville announces the sponsorship, effective December 29th, of "Elmer Davis and the News" over a nation-wide hook-up of 56 stations of the Columbia Broadcasting System. The program will be heard each evening, Monday through Friday at 8:55 P.M., Eastern Standard Time.

In announcing the sponsorship of the program, Mr. H. M. Shackelford, J-M vice president in charge of advertising said, "Probably there has never been a period in our lifetime when business conditions were more confused than at present. War brings all of us new problems every day. The challenge of the rapid changes that are taking place, must be faced by everyone in business. How well we meet that challenge will undoubtedly decide the future of our businesses after the War is over.

"Today, because conditions change so rapidly, Johns-Manville has selected radio as one of its principal advertising media. With this program our company is in a position to take prompt advantage of every opportunity and capitalize on it immediately by reaching the public without delay."

Mr. Shackelford stated that the Elmer Davis program has been a fixture on the air for several years, and has established one of the largest followings of any radio program.

Allis-Chalmers Elects New Board Chairman and President

At a meeting of the Board of Directors of Allis-Chalmers Mfg. Co., held recently in Milwaukee, Max W. Babb, President of the Company, was elected Chairman of the Board of Directors, and W. C. Buchanan a director and member of the Executive Committee was elected to succeed him as Company President.

Mr. Buchanan has for the past six years devoted a substantial portion of his time to the Globe Steel Tubes Co., in Milwaukee, of which he is President, and in which capacity he will continue.

Mr. Babb in becoming Chairman of the Board will fill the position formerly occupied by the late General Otto H. Falk, which has been vacant since his death in 1940.

These changes in management were made in order further to improve the Company's position, with particular reference to production, as heavy and increasing demands are being made on its facilities in connection with the Nation's war work.

Mr. Buchanan, who is 53 years old, was born in Johnstown, Pa., where he attended school up to the time he was 16, at which time he began studying mechanical engineering and metallurgy at a division of

• Keep Informed

Carnegie Tech. set up by the United States Steel Corp. He worked first for the Cambria Steel Co. at Johnstown in 1904 and by 1912, was in charge of a number of the company's rolling mills and finishing departments.

When W. H. Donner bought the New York Steel Co., Buffalo, N. Y., which later became the Donner Steel Co., Buchanan was engaged to assist in the rehabilitation of this plant.

Then followed a series of important jobs with the American Tube & Stamping Co., Bethlehem Steel Co., and Trumble Steel of Warren, Ohio.

After that he went into financing in Cleveland and had a hand in consolidating various steel firms, including Continental, Empire and others.

In the early part of 1929 he joined the Keystone Steel & Wire Co., of Peoria, Illinois, and was vice president and general manager of that concern when in 1935 he resigned to take the presidency of the Globe Steel Tubes Co., in Milwaukee.

With his wide experience in plant management, it is felt that Mr. Buchanan, in his new capacity, will be of the greatest practical value in increasing the output of the Allis-Chalmers Mfg. Co., at a time when the Nation's very existence depends on industrial production.

Mr. Buchanan is also a member of the Board of Directors of the Milwaukee Gas Light Co.

Mr. Max W. Babb was born in Mount Pleasant, Iowa, in 1874, and obtained his A.B. degree at Iowa Wesleyan College in 1895, subsequently studying law at the University of Michigan, where he received his LL.B. in 1897.

Upon leaving the university, he became associated with his father in the practice of law in Mount Pleasant, Iowa, where he remained for seven years.

In 1904 he moved to Chicago and joined the Allis-Chalmers Co., as its attorney, and has been with the company and its successor, the Allis-Chalmers Mfg. Co., since that time.

From 1913 to 1932, he was the sole Vice President of the company and in 1932 became its President.

Mr. Babb is a Director and member of the Executive Committee of Allis-Chalmers Mfg. Co., and is also a director of the Federal Reserve Bank of Chicago, and a trustee and member of the Executive Committee of the Northwestern Mutual Life Insurance Company. He is a director of Cutler-Hammer, Inc., and a trustee of Milwaukee-Downer College of Milwaukee, Wisconsin; also director of the Wisconsin Telephone Co.

In college he was a member of the Beta Theta Pi fraternity. He is a member of the American Bar Association and the Wisconsin Bar Association. He is a member of the Milwaukee Club, the Milwaukee Country Club and the University Club of Milwaukee.

Haering Continues Expansion

D. W. Haering & Co., Inc., with general offices in the Engineering Building in Chicago have doubled the space occupied since moving to these quarters last July first. In addition complete new service laboratory facilities have been installed in the plant at 2308 S. Winchester Ave., in Chicago and the laboratory facilities at West Monroe Street in the same city are now devoted exclusively to research.

Recent personnel changes and additions include the promotion of H. C. Daggett formerly Eastern Division Manager to the position General Sales Manager. Appointment of Nat Bailey formerly chief chemist of Waukegan Coke and Chemical Company

Continued on Page 30

Meet "DOUBLE EDDY"*

* Symbolizing the harnessed power of the double eddy current—an exclusive advantage of the Buell (van Tongeren) Dust Recovery System.

MISCHIEF-MAKER FOR EVERYONE BUT BUELL

"Double Eddy" is the little-man-who-saves-you-money on dust recovery. He works exclusively for Buell—and, on Buell equipment, has proved his ability as a dust recovery man all over the world, in every industry where dust is a problem.

The double eddy (an air current phenomenon present in all cyclone-type dust collectors) is a mischief-maker for everyone but Buell—causing trouble, cutting down efficiency. The reason? *No one but Buell can use the van Tongeren Cyclone!* This patented system embodies the only known method of harnessing the energy of the double eddy current to increase collection efficiency *on all dust sizes.*

For the complete story of "Double Eddy", send for our 24-page *"Bulletin M-2, Dust in Industry".*

BUELL'S 6 PLUSES

These are the *plus* advantages that give Buell (van Tongeren) Dust Recovery Systems outstanding superiority...

- *High Recovery Efficiency*
- *Low First Cost*
- *Low Maintenance*
- *Long Life*
- *Unlimited Capacity*
- *Fractional Efficiency Performance Guarantees*

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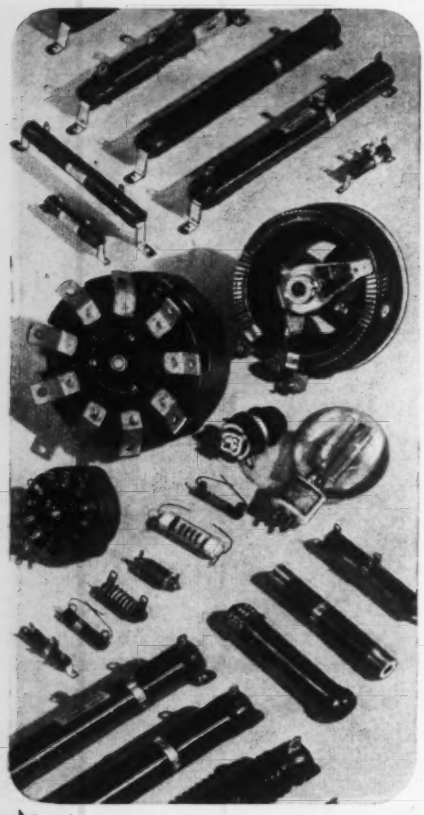
Nation-wide service through offices of either Buell Engineering Co. or B. F. Sturtevant Co.

CONSULT BUELL *First* IN DUST RECOVERY

for Chemical • Rock Product • Metallic • Food • Flue or any other dusts

buell DUST RECOVERY SYSTEMS



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RHEOSTATS ★ RESISTORS
TAP SWITCHES

Here is electrical control as you want it—Resistance Units that are known for their ability to meet exacting requirements in military, industrial, and electronic applications. The wide range of types and sizes makes it easier to meet each need. Many stock units. "Specials" produced to exact specifications or engineered for you.

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Most complete, helpful reference. 96-pages of useful data. Write on company letterhead for your copy today.

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RHEOSTATS · RESISTORS · TAP SWITCHES

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as research chemist in Chicago and addition of Tom Palen and Jarvis Johnson chemists in the Chicago Service Laboratory. Dr. Dyer B. Lake has been placed in charge of the New York Service Laboratory. F. H. Wright has been promoted to Manager of the Chicago Winchester Avenue Unit and O. R. Borngesser placed in charge of the Wichita Service Laboratory. D. R. Walser has been promoted to Chicago District Managership, C. E. Erb to Wichita, Kansas District Manager and E. H. Snyder to Houston, Texas District Manager.

George Perry has been appointed West Coast Manager and P. A. Dobson is now in charge of Los Angeles, California territory and Joseph Paulson is in charge of Portland, Oregon and surrounding area. G. Knight-Smith has been placed in Dallas, Texas; E. M. Lloyd in Baltimore, Md., Walter Beschenbossel in Minneapolis, Minn., and R. C. Rohrdanz, Superintendent of Shelley Refining Company has returned to active service for Haering in the Houston, Texas territory.

Frank W. Mrazek has been placed in charge of New Orleans, La., and W. S. Nathan has been added to the Milwaukee, Wis. staff. C. French and G. Conrow have been added to the Chicago Service Staff. W. F. Renner of Red Springs, N. C. has been placed in charge of North Carolina Operations.

Engaged in the important task of keeping American Industrial Plants operating with clean corrosion free heat transfer surfaces, Haering and Company closes nineteen forty one with one hundred per cent increase in sales and in personnel and facilities.

• *LATEST CATALOGS*

New Turret Lathe Bulletin

The new South Bend No. 2-H Turret Lathe is described in Bulletin No. 67-T, recently announced by the manufacturer.

This 4-page, letter size, bulletin is a condensed catalog which may be conveniently filed for ready reference. In it the South Bend No. 2-H Turret Lathe is fully illustrated and described. Complete specifications are given and construction features are shown.

This new lathe is adaptable to either long run or small lot production on a wide range of bar, chucking or fixture jobs. It has a capacity of 1 3/8" through the spindle hole, 16" swing over the bed and saddle wings and 1" through the collet.

Bulletin 67-T will be mailed on request from South Bend Lathe Works, Dept. 6M, South Bend, Indiana.

Heaters—Coolers—Condensers

Downingtown Iron Works, Downingtown, Pa., have just issued a new four-page Bulletin on Heat Exchangers which represents a new line of standard products for their company. Shows the various types made.

Crane Control

For use in materials handling, crane controls for hoist motors up to 330 horsepower are described in a new four-page leaflet announced by the Westinghouse Electric & Manufacturing Co.

WE READ WATER

YOU TOO CAN READ WATER

We have published a veritable water library—a fund of information on water treatment.

"Organic Methods of Scale & Corrosion Control," an authoritative 32-page treatise by David W. Haering, with 22 charts and photographs.

"Cooling Waters"—a 48-page booklet of articles on scale and corrosion in cooling systems.

"H-O-H Lighthouse Reprints"—48-page catalog containing a selected digest of articles on water treatment.

"The Solution of Your Proportioning Problem"—describes the popular Haering equipment for proportioning and sampling.

"Steam and Return System Control."

"Refrigerating Brines."

"Chrom Glucosates."

Write today for any of these and ten other booklets on water treatment for Power Plants, Refrigeration Plants, Petroleum Industry, Process Industries, Public Building and Transportation Industries.

SEND FOR THESE FREE BOOKLETS

D. W. HAERING & CO., INC.
GENERAL OFFICES: 205 West Wacker Drive
CHICAGO, ILLINOIS

Since there is no contactor in the armature circuit, it is not possible on lowering for the armature to be de-energized through the failure of a contactor without setting the magnetic brake at the same time. This eliminated the hazard of dropping the load if one of the contactors should fail.

Elimination of contactor in the armature circuit is accomplished by reversing the motor field instead of the armature on lowering. Control of the load on lowering depends upon dynamic braking or mechanical braking. Because there are no line contactors within the armature circuit, there is no chance of dynamic braking failure without the mechanical brake setting.

Wiring diagrams are used to show the comparison between the conventional and the circuit described.

A copy of leaflet B-3020 may be secured from department, 7-N-20, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

Describes Electric Furnace Brazing

How to cut production cost of metal parts with electric furnace brazing is the subject of a new eight-page booklet announced by the Westinghouse Electric & Manufacturing Co.

Percentage savings over drawing, casting, machining, drop forging and seam welding are given for typical metal parts using these processes. Electric furnace brazing, why it is used, and how it works are explained. Requirements for brazing covering materials, brazing metals, preparation, atmosphere, and furnace equipment are described.

Tabulations include all the dimensional and operating data for roller hearth, conveyor belt, and batch type copper-brazing furnaces.

The booklet is well illustrated showing many metal parts that can be brazed economically in an electric furnace and installation views of typical furnace units in industrial plants.

A copy of booklet B-3019 may be secured from department 7-N-20, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

Brown Resistance Thermometers

The Brown Instrument Co., 4486 Wayne Ave., Philadelphia, Pa. has just issued a new catalog No. 9004—"Brown Resistance Thermometers." Brown Resistance Thermometers are ideal for measuring and controlling relatively low temperatures with an extremely high degree of accuracy. In countless processes employing relatively low temperature, good products depend upon maintaining the temperature within close limits.

This new catalog is a comprehensive presentation of the nature, design, performance and application of Brown Resistance Thermometers in industrial processes, scientific work, refrigeration, air conditioning, etc. which involve the measurement and control of temperature. Schematic diagram and explanation of the principle of the Wheatstone Bridge Circuit as applied to Brown Resistance Thermometers are included in the catalog.

Each page is illustrated with an actual photographic reproduction of the various types of Brown Resistance Thermometers, Control Accessories, Moisture-Proof Rotary Switches, Key Switches and Switch Cabinets, Resistance Thermometer Bulbs, Marine Type Spray Proof Bulb, Wet and Dry Bulb Assemblies, Bulbs for Room or Outdoor Temperatures. The illustrations are fully covered by detailed descriptions and specifications to facilitate selection of exactly the right item for job requirements.

Carrier Air Conditioning Assembly

A complete line of self-contained air conditioning units providing a size and capacity to meet the requirements of many types of industrial and commercial establishments is described in a series of new bulletins issued by Carrier Corp., Syracuse, N. Y., pioneer air conditioning company.

Called "Carrier Air Conditioning Assembly," there are four types of varying size and capacity, all of which provide either summer air conditioning alone or year 'round air conditioning with heating and humidifying facilities.

These units were especially designed by Carrier engineers for industrial air conditioning and for stores and commercial uses where it is desirable or necessary to use ducts to distribute the conditioned air. They are entirely self-contained and are shipped from the factory completely assembled.

The summer air conditioning unit includes dehumidifying, cooling, and air circulation equipment in a range of capacities which permit careful selection to meet load requirements.

Two models are available in each of the four sizes, one with a removable head shell and cleanable tube condensers for heat disposal by city or well water; the other for connection to a Carrier Evaporative Condenser which reduces water usage as much as 95 percent in disposing the heat removed from the conditioned space.

Standardized by-pass section with face and by-pass dampers, and automatic control if desired, are provided, in addition to the control flexibility and operating economy of two parallel air circuits and two compressors in the larger capacities. Standard air filtering section is also available.

The year 'round air conditioning assembly provides all the features of the summer air conditioning unit plus steam or hot water heating and humidification with an evaporative type humidifier.

These units are low in first cost because of production economies effected through complete assembling at the factory; and low in operating costs and maintenance due to water and power saving features and standardized construction.

New Edition of Blue Print Reading Book

"Simple Blue Print Reading with Special Reference to Welding," Second Edition, published by The Lincoln Electric Co., Coit Road & Kirby Ave., Cleveland, Ohio; 146 pages, 5½ by 8½ inches; 96 drawings; cover—semi-flexible simulated leather, gold embossed; price 50 cents per copy, postpaid anywhere in U. S. A., 75 cents elsewhere.

This book is concisely written in simple, practical language for easy understanding. It is intended that welders, mechanics and others will be enabled, by a few hours' spare-time study, to learn print reading which otherwise might take many months to learn.

More than 50 drawings have been revised in the new edition of the volume, which is designed to aid and instruct anyone who must read blue prints, although the book has been especially published for those in the welding field.

Continued on Page 32

Tracings to be proud of ....on Paper or Cloth!

Keen draftsmen have long looked to MICROTOMIC VAN DYKE for the cleanest, sharpest blueprints from modern tracing papers and special cloths. In coverage—opacity of line—without rapid wear it tops the field. Try the 3 "pencil tracing" degrees.* At accredited dealers.

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MICROTOMIC VAN DYKE DRAWING PENCIL

THE EBERHARD FABER VAN DYKE WITH MICROTOMIC LEAD 18 DEGREES—AND 6 DEGREES WITH CHISEL POINT LEADS

Bearings by McGILL

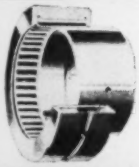
Single row ball bearings equipped with McGILL bronze land riding retainers with cylindrical ball pockets.

PRECISION

Maximum capacity double row ball bearings for greater combined radial and thrust loads. Two-piece McGILL bronze retainer allows independent rotation of each row of balls.

BEARINGS

"Solidend" MULTIROL full type roller bearing, held integral by outer race construction without end washers and retaining end rings.



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Power Plants, Structures Transmission Systems—Design Supervision, Inspection, Appraisals, Reports.
SARGENT & LUNDY
140 S. Dearborn St., Chicago, Ill.

RATE Announcements under this heading in MECHANICAL ENGINEERING are inserted at the flat rate of $1.25 a line per issue, $1.00 a line to A.S.M.E. members, minimum charge, three line basis. Uniform style set-up. Copy must be in hand not later than the 10th of the month preceding date of publication.

• Keep Informed . . .

The new book also contains eight new pages of drawings in addition to those previously used.

The text gives the students a clear understanding of symbols used in drawing various types of welded joints, including butt, corner, fillet, lap, etc. The illustrations contained in the book include practical examples of drawings of a number of machine parts, pipe connections, general construction, tanks, etc. A list of questions and answers allows the student to test his knowledge.

The book also covers, thoroughly and clearly, the essentials of general blue print reading, such as discussion of "showcase views," perspective drawings, "line of sight" projection of views and the line "alphabet."

Brown 1942 Calendar

The Brown Instrument Co., Philadelphia, Pa., has just published a new calendar for 1942. This new calendar portrays the varied problems encountered in modern industrial processes by a series of original cartoons by Bill Eddy. The drawings have been reproduced in four colors to keep them as similar to the originals as possible.

Along with the cartoons are included photographs and descriptions of the various industrial instruments and control devices manufactured by The Brown Instrument Co.

One of these calendars will be sent on request addressed to The Brown Instrument Co., 4486 Wayne Ave., Philadelphia, Pa. Ask for Calendar No. G-45.

Plastic Sheet and Sheeting

Plastic materials, in both rigid and flexible sheet form, are now receiving widespread attention because of their suitability for a host of industrial applications. To keep pace with this interest the Plastics Division of Carbide and Carbon Chemicals Corp., 30 East 42nd St., New York, N. Y. has just released a 30-page booklet entitled, "Vinylite Plastic Sheet and Sheeting."

This booklet marks the first time complete data and information have been published of the various sheet forms produced by the Carbide and Carbon Chemicals Corp. from the copolymer group of vinyl resins. Complete descriptions are given of the unplasticized sheets, and plasticized sheeting, and the film, or plastic fabric. Each is discussed in the following outline—available forms (sizes, thicknesses, colors, and finishes), characteristics, properties, and present uses.

Because a large part of the present production of these plastic materials is being assigned to defense requirements—quantity orders for commercial applications cannot be accepted. However, sample lots can be supplied so that testing work and product development can be started.

Present users of these materials have already received copies of the new booklet. Interested manufacturers may secure copies upon written application.

CO_2 Recording Equipment

Recent improvements in Micromax CO_2 recording equipment are described in a revised catalog issued by Leeds & Northrup Co. Heavy-walled glass tubing in shock-absorber mountings now brings the continuously flowing flue-gas sample from primary filter to cell assembly. Three-way cock for check purposes and condensate drain, previously of metal and external to the cabinet, are now of glass and housed in a separate compartment. Because the flue-gas sample comes in contact only with glass from the time it leaves the stack until it is automatically analyzed, maintenance due to corrosion is eliminated. In addition to a complete description of the equipment, the revised catalog contains full-size reproductions (in color) of round and strip-chart records and illustrations of installations. To receive a copy, ask Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia, Pa., for Catalog N-91-163, "Micromax CO_2 Recording Equipment for Flue-Gas Analysis."

B&W Integral-Furnace Boiler

The Babcock & Wilcox Co. has issued a new eight-page booklet describing the B&W Integral-Furnace Boiler Classes 9, 12, and 15 for lower capacities (as low as 135 hp. or 9000 lb. steam per hr.) and for stoker or oil firing. The booklet contains many illustrations and drawings defining details of operation and construction features in this new design of boiler and indicating principal dimensions for various standard sizes. A copy of this booklet may be obtained from The Babcock & Wilcox Co., 85 Liberty Street, New York, N. Y. by writing them and requesting Bulletin G-34-A.

Machinery Lubrication

Lubriplate Division, Fiske Bros. Refining Co., Newark, N. J., announces Lubriplate Film Bulletin No. 2-41 entitled "Now who'll lubricate it?" This bulletin treats on a subject of vital interest to every manufacturer of machinery . . . how can he be assured that proper lubrication of his machines in the field will be done by the users of those machines.

Unlike many discussions of industrial difficulties, this bulletin gives a direct method of overcoming the trouble. At this time when it's everyone's patriotic duty to conserve machine parts, conserve power and speed up production, proper lubrication of machinery should be everyone's business.

COMING MEETINGS AND EXPOSITIONS

For the next three months

FEBRUARY

5–6	Engineering Institute of Canada, Annual General and General Professional Meetings, Windsor Hotel, Montreal, Canada
9–12	American Institute of Mining and Metallurgical Engineers, Annual Meeting, Engineering Societies Building, New York
16–19	Technical Association of Pulp and Paper Industry, Annual Meeting, Hotel Commodore, New York.

MARCH

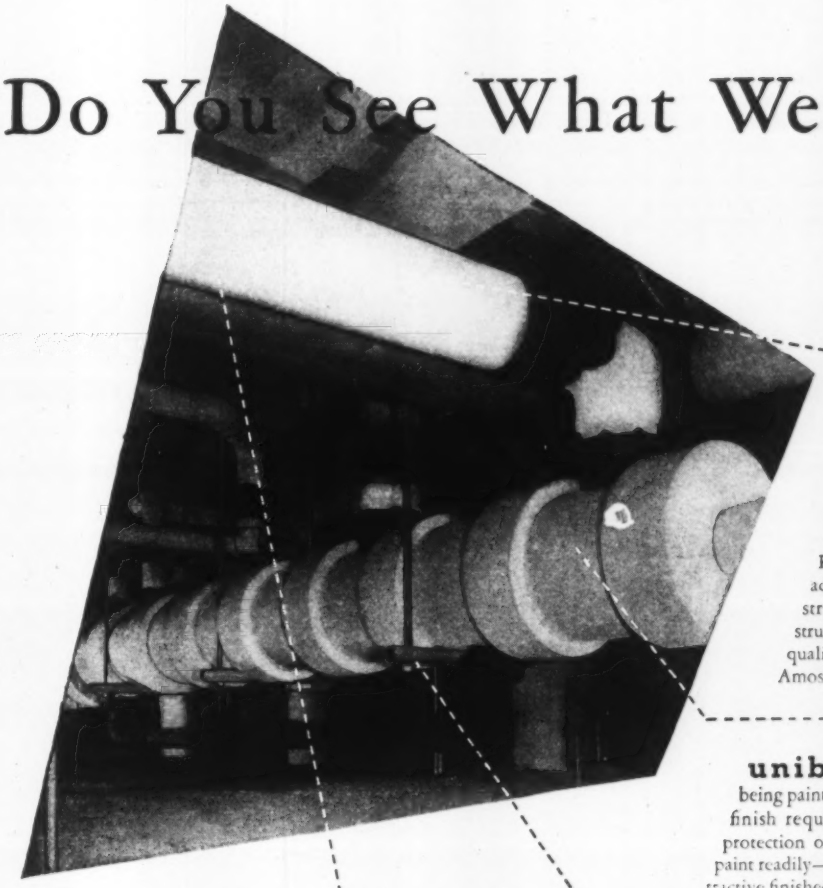
2–6	American Society for Testing Materials, Spring Meeting, Cleveland, Ohio
3–6	Greater New York Safety Council, 13th Annual Safety Convention and Safety Equipment Exposition, Hotel Pennsylvania, New York, N. Y.
12–14	American Society of Tool Engineers, Annual Meeting, St. Louis, Mo.
23–25	The American Society of Mechanical Engineers, Spring Meeting, Rice Hotel, Houston, Texas

APRIL

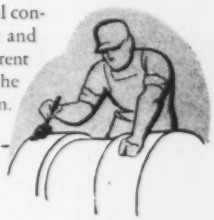
18–24	American Foundrymen's Association, 46th Annual Convention and the Foundry and Allied Industries Show, Cleveland Public Auditorium, Cleveland, O.
20–24	American Chemical Society, Spring Meeting, Memphis, Tenn.
22–24	American Society of Civil Engineers, Spring Meeting, New Orleans, La.

For Calendar of Coming A.S.M.E. Meetings see page 156 in the editorial section

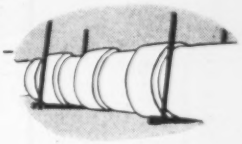
Do You See What We See?



unibestos . . .
pipe insulation being applied to the flanges as well as the pipe in this steam header. Here are illustrated the advantages of sectional construction, light weight and structural strength—inherent qualities of Unibestos, the Amosite asbestos insulation.



unibestos . . .
being painted. Hard, smooth finish requires no further protection or finish. Takes paint readily—presents an attractive finished appearance.



unibestos . . .
greater structural strength. Large pipes can be supported without cutting out insulation at bearing points. No metal-to-metal contact when Unibestos is on the job.

unibestos . . .
being reapplied. Because Unibestos can take it (thanks to Amosite)—it will not shake-down, calcinate or shatter even under most severe conditions—can be used over and over again.

unibestos . . .
is providing insulating efficiency and economies for plants throughout the country. For greater structural strength, higher thermal efficiency, easier application—they're using Unibestos—the Amosite asbestos insulation!

UNION ASBESTOS AND RUBBER CO.
1821 S. 54th ST., CICERO, ILL.

UNARCO

unibestos: CONSERVES THE VITAMINS OF INDUSTRY . . . THE **B.T.U.**

"So—when we built our new Eastern plant—we installed more CLEVELANDS"

"Most of our machines since 1925 have been operated by Cleveland Worm Gear Speed Reducers and in 16 years we have never had a machine shutdown due to failure of the Drives.

"Many of these 75 Drives are operating on equipment where a failure would mean shutting down a large portion of the plant."

When this West Coast Corporation expanded into the East they looked into their own records of speed reducer performance—and then bought more Clevelands!

What better assurance can *you* ask of trustworthy Drive performance on the machines *you* build, than Cleveland's record of long life and trouble-free operation in the heavy industries throughout North America?

The Cleveland Worm & Gear Company, 3264 East 80th Street, Cleveland, Ohio.

Affiliate: The Farval Corporation, Cleveland, Manufacturers of Centralized Systems of Lubrication

In Canada: PEACOCK BROTHERS LIMITED

CLEVELAND WORM GEAR Speed Reducers

The Standards COLUMN

News of Interest to Manufacturers

American Standard Screw Thread Gages and Gaging

A STANDARDS pamphlet describing the method for gaging screw threads as practiced in the United States is now available. Apply A. S. M. E. headquarters, price sixty cents. It was approved by the American Standards Association as an American Standard in September, 1941. In addition to describing the gaging methods it includes the tolerances for the plug and ring gages intended to gage threads in the American Standard Coarse and the American Standard Fine Screw Thread Series and also the tolerances for the gages of special screw threads, all in the several classes of fit.

The development of this standard of practice and tolerances was included within the scope of the Sectional Committee on the Standardization and Unification of Screw Threads, B1, when it was organized in 1921. However, the codifying of this practice was considered to be such a difficult task that work on this standard was delayed until a number of years of experience in the use of the American Standard for Screw Threads (B1a-1924) had been assured.

The text of this standard is divided into the following four sections: Definitions, Use and Types of Gages, Fundamentals, and Specifications for Gages.

The twelve tables are divided into the following three groups: Tolerances for W, X, Y, "Go" and "Not Go" Screw Thread Gages for the different classes of fit; the Limiting Dimensions for American Standard Screw Thread Plug and Screw Thread Ring Gages, and the Tolerances for Screw Thread Plug and Screw Thread Ring Gages having Special Pitches but American National Form of Thread.

It is the hope of Mr. Ralph E. Flanders, Chairman of Sectional Committee B1, Mr. George S. Case, Chairman of Subcommittee No. 5 on Screw Thread Gages and Gaging, and the members of their committees that this systematization of American standard practice will be given careful consideration and will be put into use by those consumers who are specifying screw threaded product of any kind and by the manufacturers who are required to produce screw threads to these specifications and for general commercial purposes. This being the first general issue of the standard the committee is prepared to have the users of it point out places where the standard may be corrected, changed, or improved. If suggestions of this kind are specific, the committee will be very grateful. They should be addressed to either of the chairmen, care of the A.S.M.E. headquarters.

For further information—address

The American Society of Mechanical Engineers
29 West 39th St., New York, N. Y.

• Keep Informed . . .

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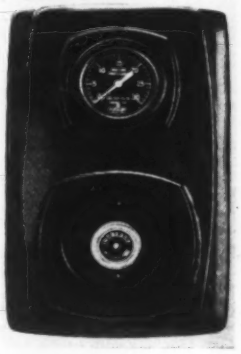
- *BUSINESS CHANGES*
- *LATEST CATALOGS*

Available literature may be secured by addressing a request to the Advertising Department of MECHANICAL ENGINEERING or by writing direct to the manufacturer and mentioning MECHANICAL ENGINEERING as a source.

• NEW EQUIPMENT

New Design for Foxboro Remote Value Control Unit

A newly designed unit for the manual control of remote valves, dampers and other pneumatically operated equipment is announced by The Foxboro Co. In appearance, the unit harmonizes with the rectangular case in which Foxboro recording and controlling instruments are now available. When the Unit is flush-mounted, its front surface is only 7/16" from the surface of the instrument panel, and as its setting knob and pressure indicator are recessed, there are no protruding parts to suffer accidental bumps.



Specifically designed for dead-end service, the Remote Valve Control Unit will hold reduced pressures, dependably, to values within very narrow limits. Although most commonly used as its name suggests, it is equally useful in other applications, such as the setting of the control points of distant instruments or the adjustment of positioning or pressure-producing pistons, located in inaccessible points. It is practical for operation over distances as great as 1000 feet.

The Unit is illustrated and fully described in Bulletin A-276 of The Foxboro Co., Foxboro, Mass., of which copies will be sent on request.

Ohmite Rheostat Cages

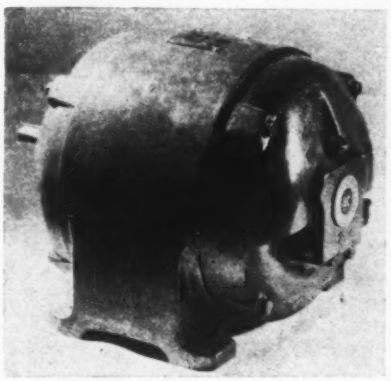
A variety of Rheostat Cages have been developed by the Ohmite Manufacturing Company for use with Ohmite Rheostats. A cage enclosure is a convenient form of table top or surface mounting and is advisable where there is possibility of mechanical injury to the rheostat or human contact with electrically "live" parts. Surface mounting cages are widely used in connection with fractional h. p. motor controls; heating device controls; on dental and medical equipment; and for use in laboratories.

Ventilated cages with perforated sides are most generally applicable. Other types available are: dustproof cages, cages to house rheostats in tandem, explosion proof cages, ventilated cages with one-half closed as a splash guard, and a laboratory type semi-enclosed table-top cage. Various types of terminals can be supplied.

For details write to Ohmite Manufacturing Co., 4835 Flournoy Street, Dept. 7A, Chicago, Illinois.

New Motor with All-Around Protection

"The greatest motor improvement in years" is how Allis-Chalmers, Milwaukee, Wis., describes the "Safety-Circle" protection of its New Lo-Maintenance Motors. Specially developed to give the motor complete all-around protection, the "Safety-Circle" is a wide, solid rib—integrally cast as part of the frame—which forms an unbroken circle of protection around the stator.



All the experience of building motors for over fifty years has been concentrated in the development of this advanced product. One-piece cast frame and cast end-shields guard the motor from exterior knocks and abuse. A more liberal use of electrical materials makes this motor internally and electrically stronger because current and magnetic densities are less extreme. Improved bearing design delivers smoother performance with full-flow lubrication and easier maintenance. Additional cross strength has been built into the distortionless stator for maximum power efficiency. Rotor is keyed to the shaft for strength, and its outer surface is turned for smoothness and an accurate air-gap. Other Lo-Maintenance features are oil drains at bottom of bearings for easy flushing, removable end-pieces, and large conduit box for handy wiring.

Finding Right Flexible Coupling Easy With New L-R Selector Charts

Anyone, without technical training, can easily and quickly find the right flexible shaft coupling, for his use, for light or heavy duty, the size, the bore, the exact coupling for his horse-power and r.p.m., the kind of load cushions for the conditions of operation, the price—everything he desires to know—with the aid of the new L-R Selector Charts supplied without charge to the industry on request, by Lovejoy Flexible Coupling Co.

L-R Couplings are made in every size for every duty from 1/6 h.p. for pumps and small equipment, to 16 3/4" bore for heaviest duty in big steel mills.

As an example of finding, suppose one wished to connect driving power of 140 h.p., at 700 r.p.m., with a driven unit for greatly fluctuating loads requiring high protective resilience. The L-R Selector Chart on Type "H" shows almost instantly the coupling for this load.

Under bold heading "R.P.M." at the left of the table the user of the chart runs his finger down to 700. That's the r.p.m. of the drive unit with which the coupling is to be used. At 700, follow the figures horizontally to the right, to 140. That's the horsepower of the drive unit.

A glance at the top of this column shows the L-R Coupling for the purpose to be Type "H" 2865. The cushion material should be selected to accommodate the nature of the load—"LX" (Leather), applicable at any speed, for unidirectional load of a uniform nature, but not adapted for highly fluctuating or reversing loads.

Easily read data right at hand, informs the chart user that the starting torque capacity is equivalent to 34.2 h.p. at 100 r.p.m. and gives maximum bore measurements, weight, price, etc. The same finding method is used for all L-R Flexible Couplings.

These handy time-saving L-R Selector Charts are available with the complete L-R Catalog, to any user of couplings on request addressed to Lovejoy Flexible Coupling Co., 4957 West Lake St., Chicago, Illinois.

Timken Prepares Special Listing of Bearings for Military Use

Early in 1941, The Timken Roller Bearing Co., Canton, Ohio, began a survey of their more than 2,500 bearing sizes to determine which ones would readily fit into the military program, increase output, and speed up delivery. Data on basic dimensions, rating and price of 687 bearings was compiled and published in September, 1941, in a 12-page "Defense Supplement" to the Timken Engineering Journal.

Recent war developments have given the "Defense Supplement" a new significance. It has proved to be a great convenience to engineers, has contributed largely to increased output, and has helped to speed up delivery. Copies are available upon request.

Continued on Page 23

Automotive exhaust manifolds must have resistance to growth, and good strength at elevated temperatures. Competitive conditions demand minimum costs.

An iron containing about 3.30% C — 2.20% Si — 0.70% Mn — 0.60% Cr — and 0.60% Mo does the trick, while holding down foundry and machining costs.

This Chromium-Molybdenum combination is characterized by high strength and toughness at the working temperatures encountered in exhaust manifolds. Its growth resistance prevents warpage and cracking — saves gaskets.

Send for our free technical book, "Molybdenum in Cast Iron," giving detailed data on Molybdenum irons of interest to production engineers and executives.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.
MOLYBDIC OXIDE—BRIQUETTES FOR THE CUPOLA · FERROMOLYBDENUM FOR THE LADLE

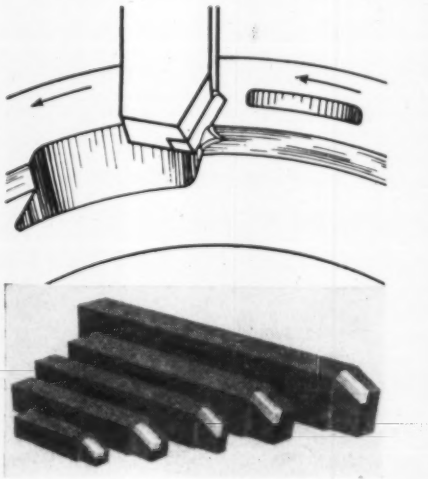
Climax Molybdenum Company
500 Fifth Avenue · New York City

MOLY

• Keep Informed . . .

New Styles of Kennametal-Tipped Tools

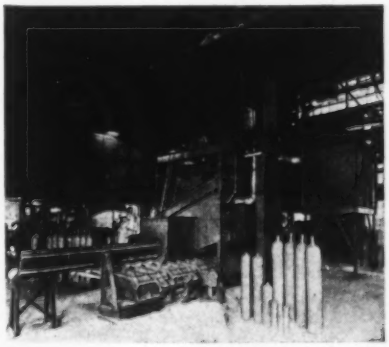
The McKenna Metals Co., 367 Lloyd Avenue, Latrobe, Pa., announces new styles of Kennametal-tipped tools especially designed for interrupted cutting of steel castings and forgings in lathes, boring mills, shapers, and planers. They are designed to speed up production in machining armor plate, tank parts, and other irregular shapes



of steel castings and forgings. It has been found that these new Kennametal tools with the unique negative shear angle of 35 degrees combined with a positive side rake of 15 degrees (see illustration) will permit the same economy in machining irregular sections as has been realized hitherto in simpler jobs cut with Kennametal.

The principle of these new tools, known as Kennametal styles 35, 36, 37, and 38, is that the interruption on the work first strikes the tool at a place back of the extreme point, where the cutting edge is mechanically strong, and then shears off the chip with a progressive action (see illustration). These tools are made in opposite hands. The tips are longer than on other standard Kennametal tools to compensate for the foreshortening of the 35° shear angle; they project above the shank at the back to allow sufficient steel under the point. The manufacturer will supply information on request.

New Airless Machine for Continuous Blast Cleaning of Steel Cylinders



Eighteen years ago the management of the Harrisburg Steel Corp., Harrisburg, Pa., was very proud of their new semi-automatic blast cleaning cabinet used for removing scale from their production of oxygen and gas cylinders—leaving the cleaned work with a bright smooth surface for finishing.

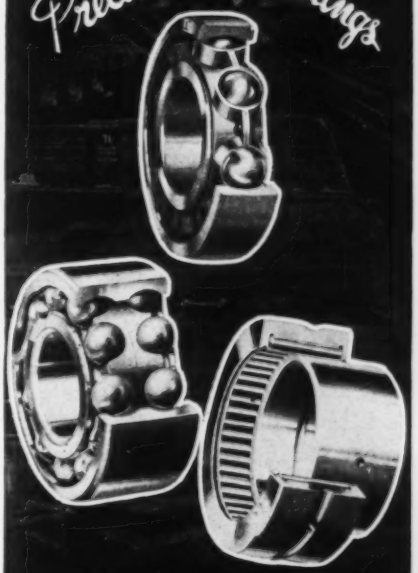
This installation gave very satisfactory service from the time it was placed in operation. Its capacity averaged 150 large cylinders per hour—ample for all peace time requirements.

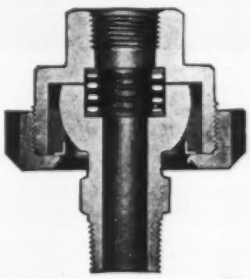
Then came the World War II. Immediately the demand for oxygen cylinders jumped to astronomical figures. The War Department needed them for the Air Corps of both the Army and Navy. Every plane that flies in the air must be equipped with oxygen for its pilot and crew. This "life line" supply comes from oxygen cylinders snugly stored away in the ship's fuselage. Hospitals and supply depots ordered tremendous additional stocks for emergencies. Production went into three eight hour shifts. But when it came to cleaning, the 1918 blast installation could not turn out enough cleaned cylinders to meet these unusual requirements.

Calling on the Pangborn Corp. of Hagerstown, Maryland for help, the new airless Rotoblast Cabinet, pictured in illustration, with its entirely automatic system of conveying work through the blast stream, was designed, built and installed in record time.

Now the Harrisburg Steel Corp. is turning out 450 large cylinders per hour, or three times their best former production. The work is being done better at lower cost, and automatically. Credit for the elimination of what appeared to be a serious bottle-neck to Defense Production is given to the efficient design and satisfactory performance of the Pangborn Rotoblast Cleaning equipment.

Continued on Page 24

McGILL
Precision Bearings

BEARING DIVISION
McGILL
MANUFACTURING CO.
1100 N. Lafayette St., Valparaiso, Indiana

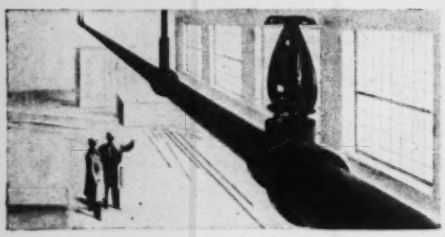

BARCO
SWIVEL JOINTS
for All Hydraulic Machinery
Send us your Hydraulic Joint Problems
MANY SPECIAL DESIGNS FOR EQUIPMENT FOR NATIONAL DEFENSE
SINGLE - DOUBLE AND THREE WAY
PASSAGE SWIVEL JOINTS FOR SHIPS, TANKS AND AIRCRAFT
BARCO SWIVEL JOINTS

Swivel 7S-8BS
Permit 360 degree Swivel movement with no tendency to bind where slight irregularities are encountered.
BARCO MANUFACTURING CO.
NOT INC.
1807 Winnemac Ave., CHICAGO, ILL.
In Canada—The Holden Co. Ltd.
Write for Catalog

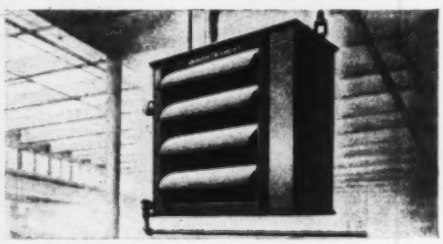
5 Proved Time-Savers for ALL-OUT PRODUCTION

IF ALL OUT PRODUCTION means expansion or reconditioning of your plant, Grinnell can probably save you valuable construction time or help you maintain uninterrupted production, through these 5 services. . . .

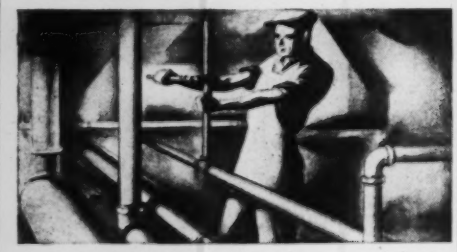
1 —**Grinnell Prefabricated Piping** saves construction time.



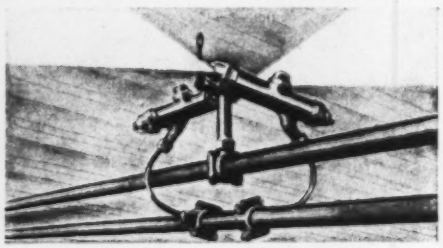
2 —**Grinnell Automatic Sprinklers,** installed with minimum disruption, guard against time and material loss by fire.



3 —**Grinnell Thermoliers** provide efficient, uniform heating—help speed output.



4 —**Grinnell Pipe Fittings** for stronger, tighter pipe connections, minimize repairs and delays.



5 —**Amco** Humidification Systems help textile mills speed production on uniforms and defense fabrics.

ONE OF THESE PLANTS OR OFFICES IS NEAR YOU . . .

Grinnell Company, Inc. • *Grinnell Company of the Pacific* • *Grinnell Company of Canada, Ltd.* • *General Fire Extinguisher Company* • *American Moistening Company* • *Columbia Malleable Castings Corporation* • *The Ontario Malleable Iron Company, Ltd.*

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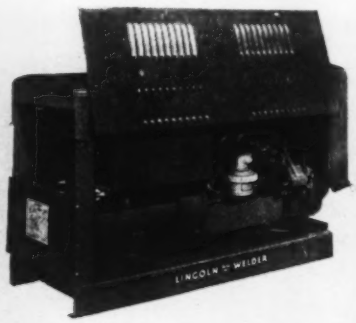
Important!—To save valuable time, please send in your priority certificates *with* your orders.

GRINNELL
WHENEVER **PIPING** IS INVOLVED

• Keep Informed

New Lincoln Engine Driven Arc Welder

A new engine driven arc welder which is specially designed for job welding and garage work and which embodies a new system of engine-speed control for maximum fuel economy and minimum engine wear, is announced by The Lincoln Electric Co., Coit Road & Kirby Ave., Cleveland, Ohio. The new welder is reported priced lower than the average shop would expect to pay for a satisfactory "build-your-own" outfit.



Of 200-ampere size (see illustration), this new Lincoln unit is engineered for profitable welding applications of all types and sizes. With a current range of 40 to 250 amperes, the machine can be used for the welding of light gauge metal, for the repair of cast iron parts such as engine blocks, for fabrication of machine parts and structures of many kinds, and for hardfacing of worn parts. Of direct current type, it can weld effectively practically all metals and alloys with bare or shielded arc type electrodes or with the carbon arc where desirable. Its compactness and light weight make it readily portable and hence suitable for work in remote locations as well as those applications which are readily accessible.

The machine's self-indicating voltage control ("job selector") and current control make it easy for the operator to select any type of arc and any arc intensity to suit the job. They provide continuous selection throughout the range.

The "job selector" is located on the right hand side of the control panel with the dial graduated to show the open circuit voltage setting that may be obtained. This control directly varies the speed of the engine from 1800 to 1400 for welding duty and thus gives very accurate control of the open circuit voltage. In addition, this control may be used to bring the engine to an idling speed of around 900 revolutions per minute. This means that the operator can manually slow the engine down whenever he plans to stop welding for more than a minute or two. At all times, the engine speed can be minimized to a rate actually required by the job at hand, keeping down fuel consumption and engine wear. The welder will generate its rated current of 200 amperes at 1400 R.P.M. and engine speeds above that are only necessary for currents in excess of 200 amperes.

The generator is single-operator, variable-voltage type with laminated pole pieces, increasing arc stability and simplifying welding. The unit is equipped with exclusive "dual continuous control," enabling variation of both open circuit voltage and welding current, independently. Produces uniform welding current for speedy welding. At the lower part of its range, it delivers a current of light penetration characteristics for weld-

ing extremely light gauge materials. At the upper portion of its range, it delivers ample current for the speedy welding of plates, angles and other relatively heavy jobs. Selection of current values through the range is continuous.

Class B insulation, used in the armature of this welder, contains no inflammable materials whatsoever. The coils wound with glass-covered wire, are held in mica-lined slots, separated by mica dividers and the leads are connected into the commutator by special, high-melting solder. No inflammable materials such as cotton, linen, fibre, wood or bakelite are used for insulation in these parts.

The welder is powered by a Hercules industrial engine equipped with centrifugal type governor, high tension magneto with impulse starter coupling, and oil bath air-cleaner.

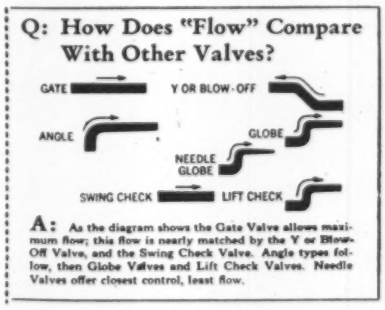
Net weight of the unit (stationary model), is 890 pounds. Dimensions: 56 inches by 37 inches by 20 inches. Full particulars are available from the manufacturer on request.

Engineering Plan Requirements on Government Contracts

Confidential expert advice is offered to government contractors and sub-contractors on a time saving method of reproducing drawings required under these government contracts. With your request for this information specifically state whether the contracts you hold are for the Army, Navy, Air Corps or whatever other governmental department is involved. All requests for this information must be made on your letterhead and signed by an officer of your Company. Address your inquiries to The Frederick Post Co., Box 803, Chicago, Illinois.

Jenkins Corrects the Indicated Flow

A number of readers have questioned the Flow Diagram in the advertisement of Jenkins Bros. which appeared on page 16 of the January issue. These queries are correct for the Indicated Flow was erroneous in each instance but one. The illustration below shows the way the flow-arrows should have appeared.



It is regrettable that this error occurred. The last minute rush to meet publication closing dates permitted this last-minute slip to creep in.

The fact that so many readers of MECHANICAL ENGINEERING detected the error is a compliment to their engineering knowledge and their quick perception. All Jenkins advertisements will be double-checked in the future.

For the benefit of those who care to have the chart (and accompanying facts) in convenient form, this useful data has been reprinted in a booklet "Where to Use Valves, Drains and By-Passes" which may be secured without cost by addressing a line to Jenkins Bros., 80 White Street, New York, N. Y.

New Service for Seamless-Tube Buyers

The Seamless Steel Tube Institute, Gulf Building, Pittsburgh, Pa., announces the establishment of a new service whereby purchasers may obtain information on the availability of various grades and sizes of seamless steel tubing for new or special war-time requirements.

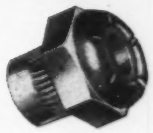
This step, it is explained, was taken for the benefit of two classes of tube purchasers. First, are those who have bought certain grades of tubing for use in peace-time products, but may be unfamiliar with sources of supply for other or special grades of tubing required for war equipment. Second, and perhaps more frequently encountered today; are those manufacturers who never before needed seamless steel tubing. This is particularly true in the case of certain specialties which are not manufactured generally, and may be available only from two or three mills. Some mills confine their output to carbon steel tubing exclusively, others specialize to a greater or lesser extent in the production of tubing of various alloys such as the stainless analyses and many of the SAE grades.

The formal announcement of this service follows numerous requests for such informa-

Continued on Page 27

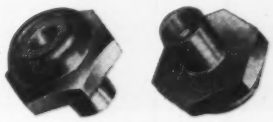
A SELF-LOCKING NUT
for every
IMPORTANT FASTENING

STANDARD-HEIGHT HEX NUTS
For all classes of bolted fastenings

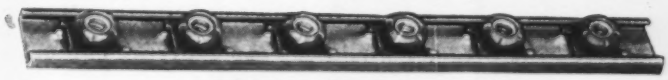

CLINCH NUTS
For insertion in sheet metal

THIN HEX NUTS
For shear bolts with light tensile load

ANCHOR NUTS
For riveting to structures (numerous types available)


INSTRUMENT-MOUNTING NUTS
For attaching instruments to control panels

SPLINE NUTS
For insertion in formed shapes and castings


GANG-CHANNEL NUTS
For multiple blind-mounted fastening of removable panels and covers

ELASTIC STOP NUTS are made in more than 2500 combinations of type, size, material, finish, and thread system . . . to provide safe and economical bolted fastenings for any mechanical or electrical application.

Each nut embodies the Elastic Stop resilient non-metallic self-locking collar that assures a tight hold under all service conditions. *Sample nuts for testing are available without cost or obligation. Specify type, size, and quantity.*

Catalog contains a graphic explanation of the Elastic Stop principle, presents test and application data, illustrates uses, and lists the complete line of nuts.

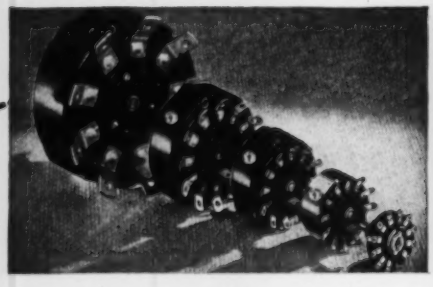
» *Write for a copy*

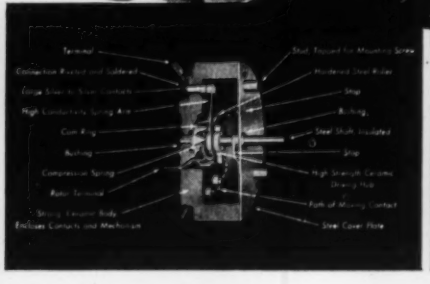
ELASTIC STOP NUT CORPORATION
2375 VAUXHALL ROAD • UNION, NEW JERSEY

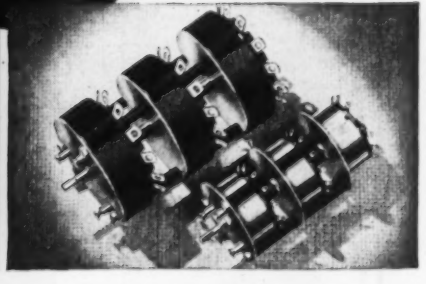
Elastic Stop SELF-LOCKING NUTS

You Get these Advantages in OHMITE High Current Tap Switches

- ★ Compact, All Enclosed
- ★ Ceramic Construction
- ★ High Current Ratings
- ★ Many Contacts
- ★ Slow-Break, Quick-Make
- ★ Silver-to-Silver Contacts
- ★ Back-of-Panel Mounting







FIVE COMPACT MODELS RATED AT 10, 15, 25, 50 AND 100 AMPERES, A. C.

These unique load-break, single-pole, multi-point rotary selectors have greatly simplified high current circuit switching in a variety of applications. They are especially useful in military aircraft, battery chargers, tapped transformers, welders, radio transmitters and other equipment.

Non-shorting type. Available in five sizes from 10 to 100 amperes, 150, 300 volts, A.C.; from 1¾" diam. to 6" diam.; with any number of taps up to 8, 11 or 12 depending on the model. Never before have so many high current taps been so compactly arranged yet perfectly insulated and protected. Two or three units can be connected in tandem to form multi-pole assemblies. Special constructional features insure trouble-free operation and extra long life. May also be used on low voltage direct current at reduced current ratings. Underwriters' Laboratories Listed models available. Write for details.

Send for Catalog and Engineering Manual No. 40

Most complete, helpful guide in the selection and application of Rheostats, Resistors, Tap Switches. Write on company letterhead for your copy today.

LET'S GO! U.S.A. KEEP 'EM FLYING!

OHMITE MANUFACTURING COMPANY, 4809 Flournoy Street, Chicago, U. S. A.

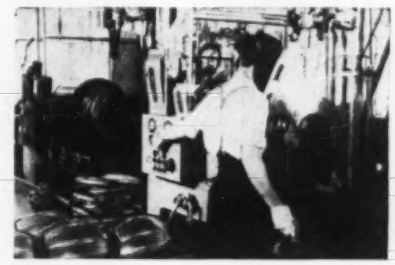
Be Right with OHMITE

RHEOSTATS • RESISTORS • TAP SWITCHES

tion received by the Institute in recent months. It is hoped that notice of the Institute's willingness to co-operate with tube purchasers in this manner will facilitate purchases and expedite deliveries of this important class of material.

Custom-Built Atomic Hydrogen Welder Speeds Flow of Munitions

Production of Bren gun magazines in a Canadian munitions plant has been substantially speeded since the recent installation of two General Electric atomic hydrogen welding machines. These machines were custom-built for the precision welding of these vital parts by G-E engineers, working with engineers of the munitions plant.



In the original factory at Brno, Czechoslovakia, this task was done by hand welders, working at benches. British manufacturers developed an automatic method, however, by which the outside seams of five magazines were welded at one time after all five magazines were clamped in a fixture. Magazines were then placed in another fixture for welding of inside seams individually.

The General Electric machines permit welding of both sides of the magazines in one fixture at one operation, effecting an important saving in time.

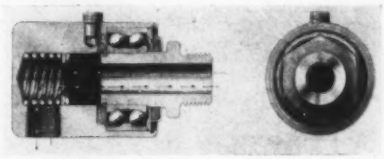
A Clock That Does the Watching

It is desirable to know how many hours in a month a large boring mill, representing an investment of a million dollars, has actually been used. The government needs to have a record of how many hours an emergency-power set for a remote radio-beam transmitter has operated. There have been total hour meters, but one handicap has been that the requisites of low cost, compactness, and sufficient digits on the cyclometer dial have not been simultaneously obtained.

In a new design developed by Westinghouse in which scrupulous attention has been given to the space required by every little part, a total-time meter of low cost has been made that, in a standard size case ($3\frac{1}{2}$ inches diameter), has a cyclometer with a register for 99999.9 hours (over eleven years) in tenths of an hour. Previous dials have had but five digits, which is equivalent to a little over a year, frequently not enough for a conclusive test. The sixth digit is especially important when the same mechanism with a different gear train is used to record minutes.

Rotorseal

Rotorseal is the name of a new device designed to act as a positive seal at the point of transmission, when air or oil, under pressure or vacuum, is transmitted from a stationary member to a rotating member, or from a rotating member to a stationary member.

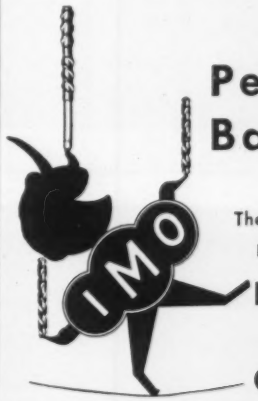


In construction, Rotorseal consists of a shaft, rotating in a sealed double row ball-bearing mounted in the housing. The seal is achieved by a special non-metallic seal nose bearing against the face of the rotating shaft. Bearing surfaces, lapped for positive seal, are self adjusting, by virtue of a spiral spring which compensates for wear, and maintains a constant and positive seal with minimum friction. The device is built for long service without attention.

Rotorseal can be run continuously in either direction and can be reversed as often as necessary. It is suitable for use at pressures up to 150 pounds, at temperatures up to 200° F, and speeds up to 2000 R.P.M. As now offered, Rotorseal is available in five sizes, with passages $\frac{1}{4}$" to $1\frac{1}{2}$".

Rotorseal is a product of the Kellogg Division of the American Brakeshoe and Foundry Company, 97 Humboldt St., Rochester, N. Y.

Continued on Page 28



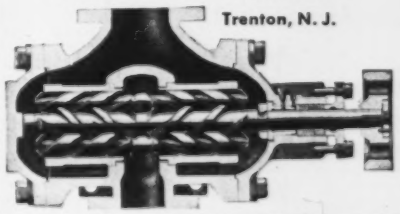
Perfect Balance

The three moving parts of the DeLaval-IMO Oil Pump

are in perfect rotational balance and the pump can be coupled to a standard-speed motor or turbine. The delivery is smooth and pulsationless, which is highly desirable in fuel oil-burner, lubrication and hydraulic pressure service.

There are no gears, no bearings, and only one packing box, the latter subject to suction pressure. IMOs are supplied for all capacities and all pressures. Ask for Catalog I-83.

IMO PUMP DIVISION
of the De Laval Steam Turbine Co.
Trenton, N. J.



HAVE YOU A PROBLEM
Where Increased Load Carrying Capacity in the Lubricant May Prove to be the Answer?

USE "STURACO" ★★★★ *EXTREME PRESSURE ("EP")*

MACHINERY OILS & GREASES

• Here is the answer to many of your lubrication problems caused by today's production demand of heavy loads, high speeds, and continuous operation of machinery and machine tools. "Sturaco" EP Oils and Greases, without any change in your accustomed viscosity or consistency, offer a minimum of 300% *increased load carrying capacity* with notable low torque.

Lubrication of ways — spindle bearings — gear heads — elevating screws — speed reducers — are typical examples where "Sturaco" application has solved tough lubrication problems. If you need help, write or phone today.

• • •

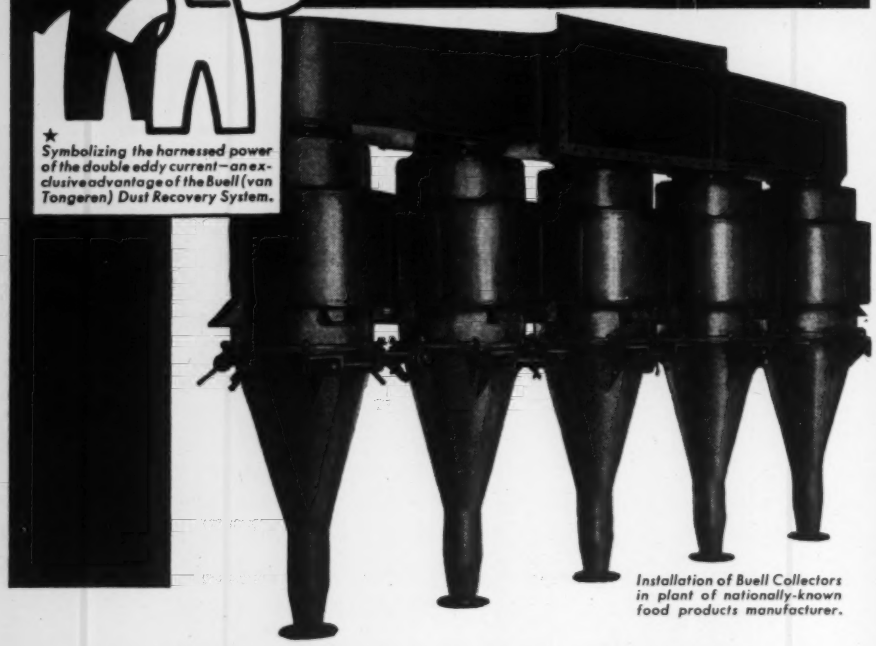
SEND FOR the new "Sturaco" booklet outlining laboratory research behind this genuine development, describing typical applications and listing various grades.

For All Cutting Fluid Problems
D. A. STUART OIL CO.
Chicago, U.S.A. • LIMITED • Est. 1865
Warehouses in All Principal Metal Working Centers

"Double Eddy" says:

The buyer wanted to know how much dust this collector would recover

★ Symbolizing the harnessed power of the double eddy current—an exclusive advantage of the Buell (van Tongeren) Dust Recovery System.



Installation of Buell Collectors in plant of nationally-known food products manufacturer.

BUELL GAVE THE MOST ACCURATE GUARANTEE KNOWN

Buell's "fractional efficiency" guarantees are famous for their accuracy. Briefly, they are guarantees to collect a definite percentage of the dust particles of each size—a guarantee that holds regardless of the inevitable and continual changes in particle size distribution that make it impossible ever to give an unqualified overall efficiency guarantee. Buell's guarantees are conservative and actual performance usually betters the guarantee.

For a typical installation, here are guarantees and actual performance:

Particle* Size in Microns	Guaranteed to Collect	Actual Collection
0 to 10	61%	63.2%
10 to 20	92%	92.6%
20 to 30	98%	98.5%
30 to 43	99%	99.4%
plus 43	99.5%	99.8%

*Specific Gravity—2.0

May we send you a copy of our special bulletin *"Fractional vs. Overall Efficiency Guarantees"?* Simply request it on your letterhead.

BUELL'S 6 PLUSES

Buell (van Tongeren) Dust Recovery Systems offer every user these six plus advantages . . .

+ *High Recovery Efficiency*
+ *Low First Cost*
+ *Low Maintenance*
+ *Unlimited Capacity*
+ *Long Life*
+ *Fractional Efficiency Performance Guarantees*

. . . all good reasons why so many of America's leading industrial concerns prefer Buell.

BUELL ENGINEERING CO., Inc.
Suite 5000, 75 Pearl Street, New York

Nation-wide service through offices of either Buell Engineering Co. or B. F. Sturtevant Co.

CONSULT BUELL *First* IN DUST RECOVERY

for Chemical • Rock Product • Metallic • Food • Flour or any other dusts

buell DUST RECOVERY SYSTEMS

• Keep Informed

A New "Bakelite" High Impact-Resistant Phenolic Molding Plastic

Bakelite Corporation, Unit of Union Carbide and Carbon Corporation, has announced the development of a new impact-resistant phenolic molding plastic, designated as "Bakelite" Phenolic Resin XM-15000. This product was developed to meet the needs of industry for a high impact-resisting molding material that can be preformed on automatic tabletting machines.

As a result, it is now the highest impact phenolic material that can be preformed in this manner. When molded, it has approximately twice the shock resistance of general-purpose phenolics. Its water resistance is also good when compared to other shock-resistant phenolic plastics.

The physical and electrical properties of molded test pieces are as follows:

Physical (Molded):

Specific gravity—1.36—Weight per cu. in.—22.2 gm.

Tensile strength—5000–5800 lb. per sq. in.

Modulus of elasticity—10–13 × 10^6 lb. per sq. in.

Impact strength—Energy to break ft. lb.—.4–.5

Impact Strength—Per in. sq. ft. lb.—4.8–6.3

Molding shrinkage—.005–.007 in. per in.

Flexural strength—8400–8800 lb. per sq. in.

	% Gain	% Swelling
Water absorption		
24 hours A.S.T.M. method	0.4–0.9	0.05–0.1
5 hours boiling 2-inch disk	1.4–1.9	0.26–0.38
24 hours boiling 2-inch disk	3.0–3.9	0.64–0.83

Heat resistance—Recommended for use where molded parts are to be subjected to temperatures up to 300 deg. F. (149 deg. C.

Electrical (Molded):

	As Is	Preheat 30 min. at 220 deg. F.
Dielectric strength at 60 cycles	110–125 volts per mil (step)	250–275 volts per mil (step)
Volume resistivity	2–3 × 10^3 megohms cm.	5–6 × 10^3 megohms cm.

To secure good electrical properties the material must be preheated.

The physical and electrical data have been determined by A.S.T.M. (or standard) samples under A.S.T.M. (or standard) tests. Pieces were molded under conditions that would impart their best finished properties.

Further technical data may be obtained from Bakelite Corp., 30 East 42nd Street, New York, N. Y.

• BUSINESS CHANGES

Allegheny Ludlum Creates New Department to Aid War Effort

The latest in a series of conservation moves instituted during the past year by the Allegheny Ludlum Steel Corp., was revealed today at the company's general offices in Pittsburgh by Wm. F. Detwiler, Board Chairman.

Mr. Detwiler announced the creation of new Scrap and Salvage Department, which will be located at the company's Brackenridge, Pa., plant, under the management of E. L. McGraw, formerly Director of Purchases. The responsibilities of the department will be shared by E. A. Grine, who was appointed Assistant Manager. "It has been

one of Allegheny Ludlum's principal concerns for more than a year past," said Mr. Detwiler, "first under the defense program and now for the much more vital war effort, to find every possible me ans of stopping waste and saving strategic metals and alloys, both in our own housekeeping and in the plants of those who use our products."

The new department was described by Mr. Detwiler as a logical outgrowth of Allegheny Ludlum's efforts to make vital metals and alloys go as far as possible. It will handle all scrap for re-melting, and all other salvageable material for any purpose.

Coincidental announcement was also made of the appointment of L. H. Bittner to the position of Director of Purchases. Mr. Bittner, who came to the Brackenridge purchasing office several years ago, formerly held the purchasing portfolio at Allegheny Ludlum's Dunkirk, N. Y., plant and brings a thorough background of experience to his enlarged duties. He will be assisted by N. W. Hayson, who was appointed Purchasing Agent. Both men will headquarter at Brackenridge.

T. B. Wood's Sons Co. New Officers

T. B. Wood's Sons Co., Chambersburg, Pa., announces that a reorganization meeting of the Board of Directors of their Company resulted in the election of C. O. Wood, President, to succeed T. M. Wood who was named Chairman of the Board.

Other officers elected are as follows: W. H. Fisher, Vice-President and Sales Manager, C. M. Wood, Secretary and Treasurer, and C. O. Wood, Jr., General Manager. These, together with G. H. Wood, compose the firm's Board of Directors.

Ethyl Gasoline Technical Services

All technical services of the Ethyl Gasoline Corp. have been merged into a single unit which will function in close cooperation with the Government, and with the petroleum and automotive industries, it is announced. A War Committee to adapt research facilities to the needs of the armed forces has been formed.

Julian J. Frey of Detroit has been appointed director of the new Technical Service Department and chairman of the War Committee. The Company's Bus and Truck Division, of which Errol J. Gay will be manager, forms an important part of the new department. Mr. Gay will work with fleet operators and heavy-duty engine manufacturers, as well as with the Army, in carrying out a program which aims at better utilization of fuels and more efficient operation of motor vehicles.

Other divisions embraced in the new department, and their heads, are: Gasoline Testing, John Clifford Pope; Passenger Car and Automotive Accessories, Richard K. Scales; Refinery Technology, William H. Hubner; Agricultural, C. G. Krieger.

Members of the War Committee, in addition to Chairman Frey, are: Earl Bartholomew, Dr. George Calingaert, Dr. Graham Edgar, S. D. Heron, Dr. O. E. Kurt.

Continued on Page 30

NUGENT FILTERS
Used on Coolant Compound Improves Product Quality.

". . . after the installation of Two Nugent pressure filters (Fig. 1116 HA No. 4R), the problem of removing grit from the coolant compound used in our centerless grinders (illustrated at the left, above) was completely eliminated . . . wheels now wear longer and a tremendous difference is noticed on the finish of the shafts, and particularly on the super-finish . . . because of longer wheel wear, better finish, and less frequent change of the coolant, a considerable savings has been effected."

—UNION SPECIAL MACHINE CO. (Chicago, Ill.)

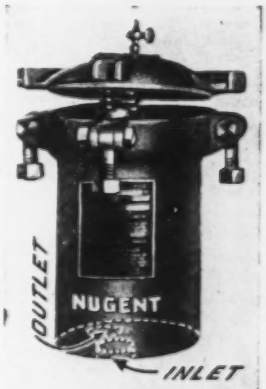


FIG. 1116
HA #4R

NUGENT TRADE MARK

WM. W. NUGENT & CO., Inc.
(Established 1897)
423 N. Hermitage Ave. Chicago

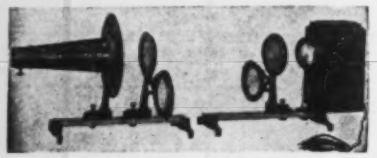
PRECISION . . . .
for the Man at the Board!

Blueprint sharpness depends on the draftsman's care . . . plus the dependability of the tools he uses. The **MICROTOMIC VAN DYKE** Drawing Pencil is first choice . . . for absolute uniformity of line . . . long-wearing needle-sharpness . . . unvarying opacity. Most used for pencil tracings—HB, H and 4H. At accredited dealers.

MICROTOMIC
VAN DYKE
DRAWING PENCIL

THE EBERHARD FABER PENCIL WITH MICROTOMIC LEAD
18 DEGREES—& 6 DEGREES WITH CHISEL POINT LEADS

Polaroid*... Photoelastic Polariscope for Stress Determination



To the machine designer, photoelastic stress analysis is not only of value in the verification of calculations based on theoretical solutions, but also in the solution of problems where theoretical analysis is not available. Where weight and space must be conserved actual stress distribution is more important than stress indicated by theoretical analysis.

In the new model polariscopes of 4¼" and 6¼" clear aperture, the parallel beam is collected by a rear element and condensed through a three component lens of the Cooke system. In the new larger units (8¼" and 10" aperture) a four component lens of the Omnar system is used. In both cases, *the image is sharp throughout the field, free of aberration, astigmatism and distortion.*

Literature of new model polariscope now available

POLARIZING INSTRUMENT CO.
630 Fifth Ave., New York, N. Y.

**T. M. Reg. U.S. Pat. Off. by Polaroid Corporation*

• Keep Informed . . .

Ampco Appoints New England Representative

Ampco Metal, Inc., Milwaukee, Wisconsin, producers of Ampco Metal, announces the appointment of J. P. Henry as its New England representative. Ampco's New England office is located in room 210 Capitol National Bank Building, 410 Asylum Street, Hartford, Connecticut.

Jones Salesmen Discuss War Production Problems

Sales and production problems brought about by the tremendous war requirements for transmission products came in for careful study at a two day conference of the W. A. Jones Foundry & Machine Co., 4427 West Roosevelt Road, Chicago, Ill., national sales force and factory executives held at the Palmer House in Chicago on January 15th and 16th, 1942.

The place of the sales organization in rendering important services to the trade in connection with proper application and use of products as well as in checking deliveries, was stressed at the conference.

Kennicott now McKenna Metals Sales Manager

W. L. Kennicott, previously Los Angeles Sales Manager of McKenna Metals Company, is now at the head office and factory at 367 Lloyd Ave., Latrobe, Pa., in the management of sales and engineering of Kennametal tools and their applications. Mr. Kennicott is a graduate metallurgical engineer of the University of Utah, and has had a substantial part in the development of Kennametal.

New Frederick Post Factory Branch

The Frederick Post Co., Box 803, Chicago, Ill., is pleased to announce the opening of a new factory branch at 1215 Capitol, Houston, Texas.

This new outlet for Post products brings to the Houston territory a complete line of Post blue print and kindred sensitized products, drafting and engineering materials.

To facilitate prompt service and quick delivery a complete stock will be kept on hand at all times.

• LATEST CATALOGS

Data on High-Pressure Condensate Return

Cochrane Corp., Philadelphia, has announced a four-page bulletin covering the new Cochrane-Becker high-pressure condensate return system. Fifty different industries are listed in which appreciable increases in production rates and excellent fuel savings are being made by the use of this unit in draining jacketed kettles, drying rolls, coil cookers, dryers, unit heaters, laundry and platen presses, and similar equipment that depends on uniformly high steam temperatures for efficient operation.

A typical installation is described in detail with a four-color illustration showing steam, condensate, and makeup lines. A similar drawing illustrates the operation of the jet-loop principle on which the system operates. Detailed engineering specifications cover the technical features of design and construction.

Copies of this new bulletin may be secured from Cochrane Corp., 3142 No. 17th Street, Philadelphia, Pa., by requesting Publ. 3025.

Expansion Joints

A new 14 page illustrated Bulletin No. 35-15B is available on the ADSCO Piston-Ring Type, Model A Expansion Joint which can be unpacked and repacked under full operating pressure without interruption to service. Details of construction, dimensions, specifications, etc., are given in the bulletin on this joint which is made in sizes from 2–20" for all pressures up to 400 lbs. A copy of the bulletin may be obtained upon request from the American District Steam Co., North Tonawanda, N. Y.

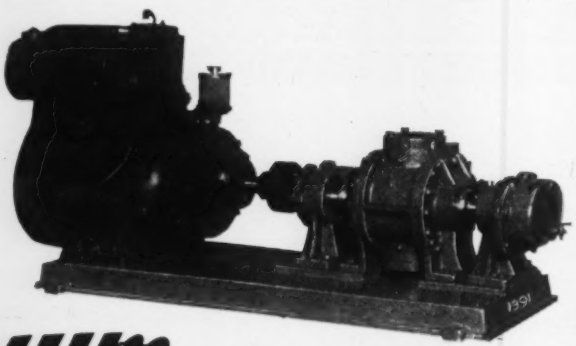
Water Cooled Stokers

"A new catalog, completely descriptive of the operations, advantages, and applications of the Water-Cooled Taylor Stoker has just been released by the American Engineering Co., Philadelphia, Pa. It is available to interested steam operators."

New J-M Industrial Products Catalog

The new 1942 edition of the Johns-Manville Industrial Products Catalog is now available. This 52-page, illustrated book contains a wealth of information and recommendations on high and low temperature insulations for every industrial need from 400 deg. F. below zero to 2500 deg. F. above. Complete data are also included on J-M refractory products and castables; specifications on J-M Bonded Asbestos Built-Up Roofs and J-M Insulated Roofs; detailed information on J-M Corrugated Transite for roofing and siding; on J-M industrial friction materials; on Transite Electrical Conduit and Korduct, Asbestos Ebony and other J-M electrical materials; on Transite Pressure Pipe for industrial and municipal water

Roots CONNERSVILLE SINCE 1854



Vacuum FOR PRIMING AND OTHER SPECIALIZED APPLICATIONS

If you want quick, positive suction—large capacity in a relatively small unit—get the facts on Roots-Connersville Vacuum Pumps. Several types and many sizes, handling air and liquids mixed in any proportion, adaptable to any application requiring vacuums up to 25" Hg.

Unit shown is used in a municipal plant and has a capacity of 59 CFM at 1700 RPM, with a suction lift of 15 ft.

ALL OUT for VICTORY

ROOTS-CONNERSVILLE BLOWER CORP.
203 Michigan Avenue, Connersville, Indiana

NEW YORK CHICAGO POTTSTOWN, PA. SAN FRANCISCO
DETROIT ST. LOUIS LOS ANGELES PITTSBURGH BOSTON

• Keep Informed

lines; on Transite industrial vent pipe and stacks; and on J-M packings and gaskets.

The catalog also describes in detail J-M Industrial Flooring Plank, Asphalt Tile Flooring and Transite movable partitions.

Copies of this book, Form GI-6A, are available upon request to Johns-Manville, 22 East 40th Street, New York, N. Y.

Variable Speed Control

Reeves Pulley Co., Columbus, Ind., announces a 16-page booklet, "More Output for Defense" (No. G-423) which has just been issued.

This booklet illustrates and describes numerous uses and applications for Reeves variable speed control equipment in defense industries and plants on many different types of machines. It shows how to increase production and cut waste.

Gas Burning Diesel Engines

Nordberg Manufacturing Co., Milwaukee, Wis., announces a new bulletin No. 106 descriptive of their Gas Burning Diesel Engines.

In this Bulletin no attempt has been made to go into a detailed description of Nordberg Diesels, but they have endeavored to bring out the features of burning natural gas on the full Diesel principle.

Unit Heaters

A new bulletin describing Carrier "Five-Way Unit Heaters" has been published by Carrier Corporation, Syracuse, New York.

The heaters, which get their name from the fact that they distribute air in four directions and downward, are available in a wide range of sizes and capacities. They are especially suited for industrial plants, commercial establishments and large offices.

Copies of the bulletin, 46S-3, may be had by addressing Carrier Corp., Syracuse, New York.

The Latest in Gauges

A new 1942 Ashcroft Gauge Catalog has just come from the press. It contains listings of numerous new gauges, streamlined gauge cases, gauges for special services and a complete listing of Dura-Gauges.

In addition to these listings, the new catalog illustrates the various gauge testers and numerous accessories required by all gauge users.

A copy of the 64-page Ashcroft Gauge Book will be sent to any gauge user interested in having a copy of same if they will address the manufacturer, Manning, Maxwell & Moore, Inc., Bridgeport, Conn.

New G-E Catalog on Electric Heaters

Publication GED-650B, just issued by the General Electric Co., lists the complete line of G-E electric heaters, heating devices, and heat control equipment. Each item in the line is pictured, and many are accompanied by a list of applications as well as by installation and operation data.

Many photographs show interesting jobs being done by electric heaters in industry. Information useful in calculating power requirements, a tabulated list of uses for G-E electric furnaces, and a list of G-E industrial heating publications round out the catalog.

How Accurate Speed Changing Steps Up Defense Production

One easy, effective way to step up production from available machine capacity is by increasing machine flexibility with instant, positive speed control. This is the story

Continued on Page 32

We've Helped Others *to Save Defense Materials* For Many Years!

A war of resources and resourcefulness breaks out and a nation becomes conservation conscious. We've got to save vital materials so we can use them where they'll do the most good.

Amsco has been conservation conscious for over 30 years. We've preached it in the market place. We've demonstrated time and again that by using Amsco 13% Manganese Steel Cast parts where impact and abrasion are involved, fast wear and costly replacements resulting from misapplication of ordinary steel are eliminated.

All Amsco products serve to reduce the consumption of vital metals by minimizing replacements — thus saving man-power as well.

You can help yourself and help the defense effort by applying Amsco Manganese Steel wearing parts to equipment that is subjected to heavy impact and abrasion. Amsco engineers and metallurgists will assist in adapting Manganese Steel to your particular needs.

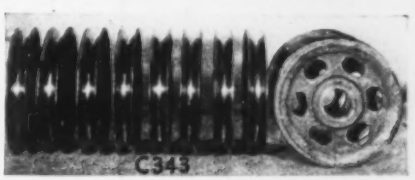
Amsco Manganese Steel Aids Defense by Conserving Steel in Coal Mining

Manganese Steel work-hardens, withstands shock stresses, outlasts other metals used for power shovel dippers. Amsco builds dippers and makes parts for all shovels—for construction, tunneling, mining, dredging.

Blast Furnaces and Steel Mills

The men who know steel best use Manganese Steel for equipment parts exposed to shocks and abrasion.

For All Industry



Manganese Steel Sheaves represent many applications in factory, field and mine that save time and money and help to maintain continuous production.

Amsco

AMERICAN MANGANESE STEEL DIVISION
OF THE AMERICAN BRAKE SHOE & FOUNDRY CO.
Chicago Heights, Illinois

Manganese Steel Castings for shocks and abrasion.
Chromium-Nickel Alloy Castings for heat and corrosion resistance.
Power Shovel Dippers. Dredge and Industrial Pumps.
Welding Materials for reclamation and hard-surfacing.

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RATE Announcements under this heading in MECHANICAL ENGINEERING are inserted at the flat rate of $1.25 a line per issue, $1.00 a line to A.S.M.E. members, minimum charge, three line basis. Uniform style set-up. Copy must be in hand not later than the 10th of the month preceding date of publication.

• Keep Informed . . .

graphically illustrated in a new bulletin on the Vari-Pitch Speed Changer, issued by the Allis-Chalmers Manufacturing Co., Milwaukee, Wis.

Diagrams, operating data and selection tables offer facts on Speed Changer units in sizes handling from $1^1/_2$ to 75 hp. With these units, speed variations are readily available in a range of 375 per cent. Instant adjustment is possible either manually or with a pilot motor.

Photographs of the newest applications of modern speed changing equipment throughout industry are used in great number in the bulletin, B6013A. As a result, quick comparisons with individual requirements are possible.

Link-Belt Speeder

The Link-Belt Speeder LS-60 heavy-duty $^1/_2$-yd. crawler shovel, dragline, crane is covered by a new 8-page illustrated Book No. 1929, published by Link-Belt Speeder Corp., 301 West Pershing Road, Chicago.

New simplicity, reserve power, easier handling, all welded construction, are features stressed. Illustrations show the machine at work and how it is built.

Working ranges, lifting capacities, clearance dimensions and other pertinent data are given for shovel, dragline, crane, clamshell and trench hoe operation.

A copy of new Book No. 1929 will be sent to any interested reader on request.

New Safety Tool Folder

"Protection Against Fire and Explosion" is the title of a folder issued by Ampco Metal, Inc., 1745 So. 38th St., Milwaukee, Wis., producers of Ampco non-sparking safety tools, made from Ampco Metal and Ampco Beryllium-copper.

Designed to be used in the presence of explosive fumes, gases and dust, these tools are essential in ordnance plants, refineries, chemical plants and similar fields. Over 400 different items are carried in stock. The folder illustrates a varied selection of tools and contains a view of a typical kit.

Lubrication of Machinery

Lubriplate Division, Fiske Bros. Refining Co., Newark, N. J., announces the latest issue of "Lubriplate Film" entitled "Lubriplate Lubricant No. 130-A Proves Outstanding on Production of War Materials." It contains valuable information for the manufacturer producing war materials and will help him in the better care of his machinery.

Farrel Marine Gears in Action

Farrel-Birmingham Company, Inc., Buffalo, N. Y., announces a new and comprehensive 36-page booklet which describes and illustrates Farrel Marine Reduction Gear Drives now in service on principal types of ships. These include vessels for the U. S. Navy, U. S. Army Engineer Corps, U. S. Coast Guard, U. S. Maritime Commission and commercial craft such as tugs, trawlers, freighters, tankers, ferries, dredges and pleasure boats.

The editorial treatment of this new booklet is exactly what the name implies, "Farrel Marine Gears in Action." Illustrated with each vessel is an installation or factory view of the particular type of reduction gear employed, and, in many cases, arrangement drawings to show the relationship of the propulsion unit to other engine room equipment. The text is factual in nature, stating various problems peculiar to each different type of service and the solutions of these with reduction gear drive, giving engine speeds, shaft speeds, propeller diameters, pitches and other interesting data on service operation.

Included also, are applications of Farrel Gear Drives with electric couplings, ladder and pump drives for dredges, Gearflex and Manger flexible couplings.

This non-technical booklet on application of marine reduction gear drive will be of general interest throughout the marine industry and free copies are available upon request to the editor or directly to Farrel-Birmingham Company, Inc., 348 Vulcan St., Buffalo, N. Y.

Chromium Plating

Since chromium plating first met with commercial success, Chromium Corporation of America has been foremost in the development and perfection of industrial applications. The trade mark "Crodon" identifies all chromium plating supplied by the Chromium Corporation of America and typifies the dependable standard in chromium plate. Enviable performance records have been attained. "Crodon" plate is more and more becoming a standard specification for the utmost in operating efficiency and cost reduction.

A 24-page booklet is available. It gives industrial applications and discusses the use and application of chromium plate and its cost and also treats on characteristics, standard plating specification, plating facilities, reclamation of worn parts, etc. Copies of this booklet may be had by sending a request on your letterhead to Chromium Corporation of America, 120 Broadway, New York, N. Y.

COMING MEETINGS AND EXPOSITIONS

For the next three months

MARCH

2–6	American Society for Testing Materials, Spring Meeting, Cleveland, Ohio
3–6	Greater New York Safety Council, 13th Annual Safety Convention and Safety Equipment Exposition, Hotel Pennsylvania, New York, N. Y.
12–14	American Society of Tool Engineers, Annual Meeting, St. Louis, Mo.
23–25	The American Society of Mechanical Engineers, Spring Meeting, Rice Hotel, Houston, Texas

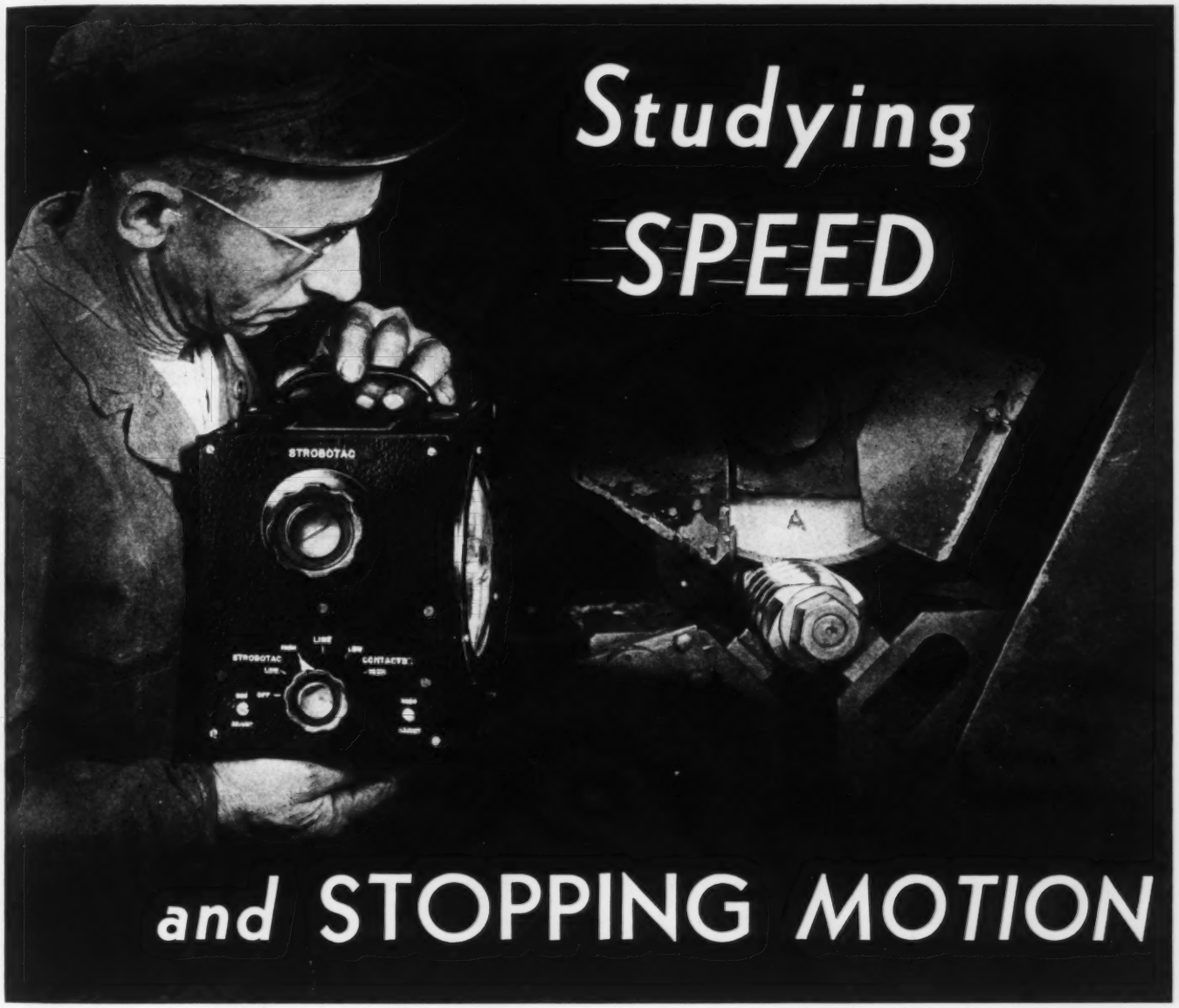
APRIL

9–10	Midwest Power Conference, Palmer House, Chicago, Ill.
19–23	American Society of Civil Engineers, Spring Meeting, Hotel Roanoke, Roanoke, Va.
20–24	American Foundrymen's Association, 46th Annual Convention and the Foundry and Allied Industries Show, Cleveland Public Auditorium, Cleveland, O.
22–24	American Chemical Society, Spring Meeting, Memphis, Tenn.

MAY

7–9	Society for the Advancement of Management, Spring Conference, Cincinnati, Ohio
11–13	American Institute of Chemical Engineers, 34th Semi-Annual Meeting, Boston, Mass.
25–28	American Petroleum Institute—12th Mid-Year Meeting, Oklahoma-Biltmore Hotel, Oklahoma City, Okla.
28	American Iron and Steel Institute, General Meeting, New York
31–June 5	Society of Automotive Engineers, Semi-Annual Meeting, The Greenbrier, White Sulphur Springs, W. Va.

For Calendar of Coming A.S.M.E. Meetings see page 244 in the editorial section



THE STROBOTAC lets you see this high-speed helical gear grinder in operation just as this mechanic sees it . . . absolutely stationary . . . although it is revolving at 10,400 rpm!

With a slight adjustment of the STROBOTAC the grinder appears to revolve in s-l-o-w motion . . . even as slow as a fraction of an rpm . . . so that the exact cutting angle, depth and shape of cut can be seen.

The STROBOTAC has helped thousands of others to speed up production and to cut down shutdowns. It can help you if you want to see how your equipment runs . . . if you want to stop or slow down motion in any machine or part operating at any speed up to 100,000 rpm!

In addition the STROBOTAC is a very accurate electrical tachometer for measuring rpm; it is direct reading from 600 to 14,400 rpm; it requires no mechanical or electrical connection to the machine or part under observation; it places absolutely no load on even the lightest piece of equipment; it is ideal for speed measurements on motors and other revolving equipment when the machine is in a hard-to-get-at place; it costs only $95.00 complete and ready for immediate use.

Because practically all of our manufacturing facilities are devoted to National Defense projects, to secure this equipment a preference rating certificate or other approved priority rating will be necessary to secure scheduled delivery.

The STROBOTAC can help you. Let us show you how!

● WRITE FOR BULLETIN 756 FOR DATA

GENERAL RADIO COMPANY CAMBRIDGE MASSACHUSETTS

"We O. K. Your Recommendations

and—we do not have any shutdowns"

★

"As your records show, we have installed Clevelands frequently since 1923," writes the Engineering Executive of a long-established Eastern Corporation.

"We first tested three makes of gear reducers, but found Clevelands most capable of carrying our heavy 24-hour loads. In general, we accept your engineering recommendations and—*we do not have any shutdowns.*"

Cleveland Engineering recommendations are sound and trustworthy—you and your customers can accept them with confidence.

And, even after many years' continuous operation, Cleveland owners report "no maintenance cost worth recording."

Clevelands keep your machines going in customers' plants! The Cleveland Worm & Gear Company, 3264 East 80th Street, Cleveland, Ohio.

Affiliate: The Farval Corporation, Cleveland, Manufacturers of Centralized Systems of Lubrication

In Canada: PEACOCK BROTHERS LIMITED

CLEVELAND WORM GEAR *Speed Reducers*

The Standards COLUMN

News of Interest to Manufacturers

Pipe Threads

Following the close of the sectional committee vote, the Subcommittee on Editing and Gaging of Sectional Committee B2 charged with the revision of the American Standard for Pipe Threads (both taper and straight), prepared the draft for submission to the two sponsor organizations for vote on approval and transmission to the American Standards Association. In other words this means that the technical work connected with this revision is now completed. Mr. Arthur M. Houser, Sr., is the chairman of this Subcommittee No. 1 on Editing and Gaging.

This revision of one of industry's oldest mechanical standards has been one of the most thorough jobs which the Society has undertaken in a long time. No part of the original standards pamphlet (1919) or the standard itself was considered sacred. Even the form of the screw thread was examined in the light of recent experiences in adapting this type of thread to modern conditions. This, of course, includes the experience of the American Petroleum Institute in the use of its line pipe screw thread.

The present revision contains the following principal changes and additions: (1) the complete revision and further development of the gages and gaging of the standard taper pipe thread; (2) the addition of an entirely new section on the straight pipe thread including the detailed dimensions of all the principal applications of this type of screw thread for pressure tight, free fitting, and loose fitting joints; (3) the complete unification of the terminology and the letter symbols throughout the standard with those favored by the National Bureau of Standards and the American Petroleum Institute. A summary of this terminology, definitions, and the approved letter symbols forms a four page appendix to the revised standard.

The committee which is responsible for this revision consists of thirty-eight (38) members and eight (8) alternates. These members represent twenty-three (23) national organizations, societies, and government departments which have a vital interest in the manufacture and use of pipe threads both taper and straight. The personnel includes also ten (10) engineers having a special interest in the standard who have the designation "Member-at-Large." The Sectional Committe is headed by Mr. Alten S. Miller as chairman who represents the American Gas Association on this committee. Mr. Clifford B. LePage has served the committee as Secretary. The A.G.A. and The American Society of Mechanical Engineers are the joint sponsors for the project and the committee.

For further information—address

The American Society of Mechanical Engineers
29 West 39th St., New York, N. Y.

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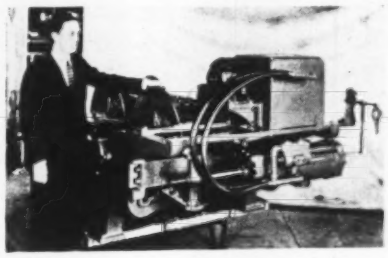
- *BUSINESS CHANGES*
- *LATEST CATALOGS*

Available literature may be secured by addressing a request to the Advertising Department of MECHANICAL ENGINEERING or by writing direct to the manufacturer and mentioning MECHANICAL ENGINEERING as a source.

• NEW EQUIPMENT

Variable Speed Transmissions

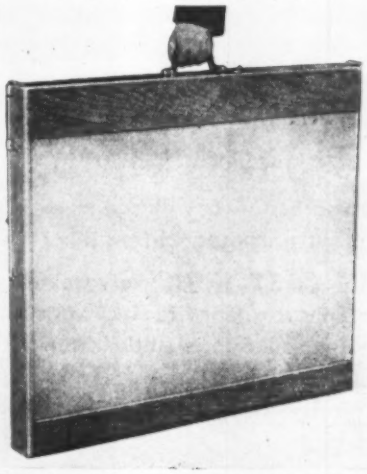
The largest variable speed transmission to be equipped with hydraulic automatic control was recently built by Reeves Pulley Co., Columbus, Ind., for use on a rotary veneer lathe in a South Carolina plant.



This transmission, weighing 4300 pounds uncrated, is nearly 9 feet long, 5 feet wide and stands almost 4 feet high, overall. It transmits 26 HP at maximum speed and provides infinitely variable speeds over a speed ratio of 3:1.

The hydraulic control provides completely automatic speed variation on the transmission. The purpose, in this particular installation, is to maintain uniformly high peripheral cutting speed on the log from full original diameter down to the smallest diameter at end of the cut. Without this control, speed of rotation of the log would decrease as its diameter decreased, so that much less veneer would be cut toward the end of the run than at the start. However, with hydraulic control, peripheral speed is automatically increased as diameter is reduced, thus maintaining constant high cutting speed and production rate.

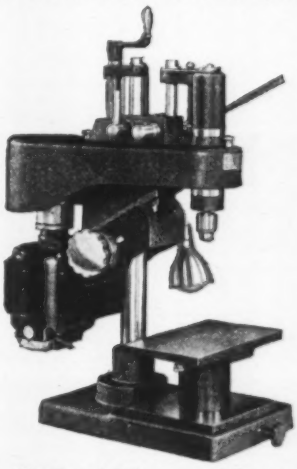
Portable Tracing Board



Hamilton Manufacturing Co., Two Rivers, Wis., announces their new No. 188 Portable Tracing Board. This Board is good news for those who have been looking for a compact space-saving tracing unit. It is easy to use and you can have not one, but several boards in use at the same time. You do not need extra table space when you have Hamilton Tracing Boards. Cool daylight Fluorescent Lamps furnish even, glareless light . . . 24″×36″ plate glass tracing surface . . . adjustable stop rods hold the board in place when usedon an inclined surface. Black split leather handle bolted to top edge. Board overall is 36″ × 31″ × 3⅜″ deep. Made of white pine, manolac finish . . . for 110 volt alternating current only. You can use this board to great advantage in any drafting room.

Super-Sensitive Drilling Machines for Small Holes

The Hamilton Tool Co., Hamilton, Ohio, have available a distinctly new, precision-built drilling machine for small holes .004″ to 5/16″ diameter. It is known as the Hamilton-Muehlmatt "Varimatic" Super Sensitive Variable Speed Drilling Machine. It departs most radically from anything heretofore offered in range of speed, sensitivity, ease of operation, and all around performance. The drilling unit is self-contained and swings radially on the column and locks in any position. All controls are manually operated.



The "Varimatic" is a machine tool built with "instrument precision" and can be used with confidence on the finest work done in tool rooms as well as in instrument, Diesel, electrical, aircraft, and many other precision manufacturing plants. Whether used in the production department, the laboratory, the tool room, or as an all-purpose machine in the shop, its performance will measure up to all expectations. Bulletin "V" fully describes the "Varimatic" Super Sensitive Drilling Machines.

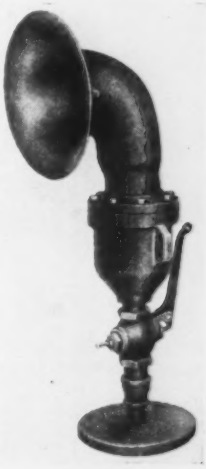
New Sweeping Compound

Industry, more than ever, is obligated to reduce hazards that cause fire. Spills of oil and grease accumulating on floors are a frequent source of fire. Carey Grease Ball Asbestos Sweeping Compound effectively removes oil and grease deposits from floors and driveways. This inexpensive asbestos compound contains no acids or caustics and will not cause erosion. It eliminates the danger of slipping and fire hazard due to oil and grease accumulations.

Grease Ball Compound is readily applied by sprinkling it on the deposit. Heavy grease may first require soaking with kerosene. Scrubbing with a broom causes absorption of the oil and grease which can then be swept away. A further advantage of this compound is that it can be re-used until thoroughly soaked. This product is recommended for garages, filling stations, factories, refineries, power plants, etc., where oil and grease spillage occur.

Grease Ball Asbestos Sweeping Compound is manufactured by The Philip Carey Mfg. Co., Lockland, Cincinnati, Ohio, and is available in 50 lb. bags. Price will average from 3½¢ to 4¢ per pound.

New Siren for Air Raid Alarm



Here is an air raid siren that is audible for miles—has a rising sound pitch or howl that reaches its maximum tone in from three to five seconds. Furthermore, it is well adapted for signalling because of a sharp sound cutoff. Operates on steam or air at 50 to 250 pounds pressure, 425 degs. Fahr. total temperature. All bronze or steel and bronze construction. Complete information may be had by writing to the Foster Engineering Co. at 107 Monroe Street, Newark, N. J.

"Unibestos"—The Half-Section Steam Pipe Insulation

Illustration shows workmen applying Unibestos, the half-sectional steam pipe insulation, manufactured by the Union Asbestos and Rubber Co. The half-section feature of Unibestos permits easier handling and a more efficient insulating job. This half-section construction is available in all pipe sizes up to 36″, thicknesses up to 5″.

Unibestos saws or cuts easily with ordinary tools. It is easy to strip off layers to fit unions, flanges, etc. Standard (750°F) and Super (1200°F) material are available in

Continued on Page 23

PRACTICAL DATA FOR PRESENT PROBLEMS

Here are two books designed to help users of Molybdenum steels and irons to conserve all alloying elements, and possibly steel and iron, by getting the most in the way of strength, toughness and wear resistance with the lowest alloy content.

"MOLYBDENUM IN STEEL" covers the fundamental metallurgy of Molybdenum steels. Heat treatment – physical properties – applications – of a number of these steels are treated at length.

"MOLYBDENUM IN CAST IRON" covers the effect of Molybdenum in gray iron, giving suggested analyses for practical applications and detailed discussion of high strength (60,000 p.s.i. and up) irons.

Both books will gladly be sent free on request.

Climax Molybdenum Company
500 Fifth Avenue · New York City

MOLY

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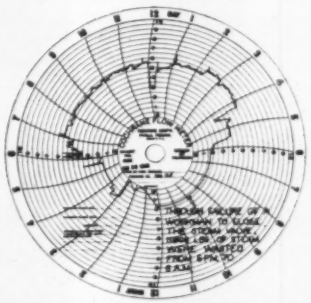
single layer construction with provision for expansion in piping.

Further facts regarding heat loss, thermal efficiency, etc., are available upon request from the manufacturer, the Union Asbestos & Rubber Co., 1821 South 54th Ave., Cicero, Illinois.

Flow Meter Record Discloses Waste of Steam in Hog-Killing Plant



This chart is the 24-hour record of steam consumption in the hog-killing department of a Chicago plant. It is interesting because it shows a consumption of steam from 6 p.m. to 6 a.m., when the department should not have used steam.

Investigation disclosed that steam had been permitted to leak into the hot water heater all night, some one having neglected to close the steam valve tightly. The loss was 111,600 pounds of steam, costing $33.00.

This is only one illustration of the value of departmental steam flow meters made by Cochrane Corp., 17th St. & Allegheny Ave., Philadelphia, Pa.

New Signalling Controller Tests Condensate Automatically

At exceptionally low cost, the industrial steam plant can now have dependable protection against damage caused by contaminated condensate, by using Leeds & Northrup's new signalling controller.

Used where indicating and recording of condensate purity are not needed, this simple, automatic equipment tests condensate purity continuously. Its self-contained signal lights show whether condensate is above a specified minimum purity and is safe to use again, or whether it is below this limit and should be diverted to waste.

In addition, the instrument can operate external warning bells or lights. Or, it can provide automatic two-position control by regulating a motor-driven valve in the condensate line to dump impure condensate.

If the operator wishes to measure condensate resistance, he can do so by turning the instrument's control-setting dial until both signal lights are out, and reading the dial scale.

An 8-page catalog describing this equipment has just been issued. To receive a copy ask Leeds & Northrup Company, 4934 Stenton Avenue, Philadelphia, Pa., for Catalog N-95-163(1), "Simplified Signalling Controller for Automatic Testing of Condensate Purity."

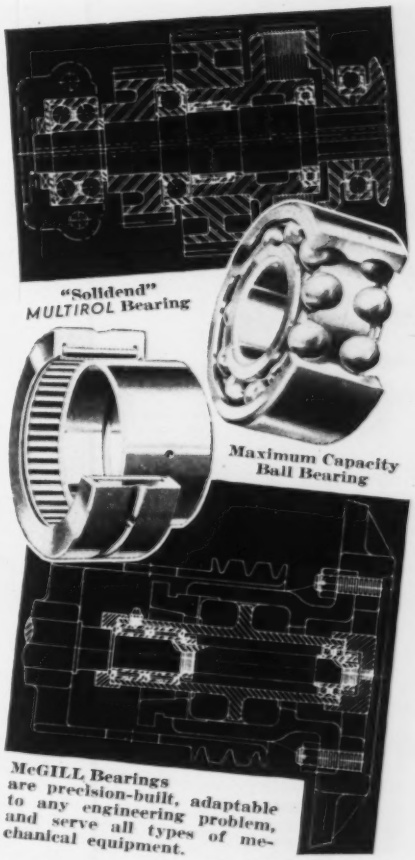
Cochrane Marine Deaerators For Petroleum Shipping Company

Each of the Petroleum Shipping Company's new tankers built by Sun Shipbuilding and Dry Dock Co.—the Melbourne, Palembang, and Wellington—are equipped with a Cochrane marine deaerator of the atomizing type. The design of the Cochrane marine deaerator permits the use of shells of various shapes to meet exacting space restrictions. There are the additional advantages that great flexibility in arrangement of accessory equipment and wide latitude in location of openings are afforded. The principle of deaeration by atomization was developed expressly for shipboard use and insures removal of dissolved oxygen regardless of roll, pitch, or list of the ship.

"Maxitorq" Multiple Disc Clutches

The Carlyle Johnson Machine Co., 52 Main St., Manchester, Conn., announces their new "Maxitorq" Floating Plate Multiple Disc Clutch. In this new design of a Multiple Disc Clutch, several features have been added which are new to multiple disc clutch construction. There are: a unit which can be manually assembled and disassembled; a unit in which the plates are free

Continued on Page 24



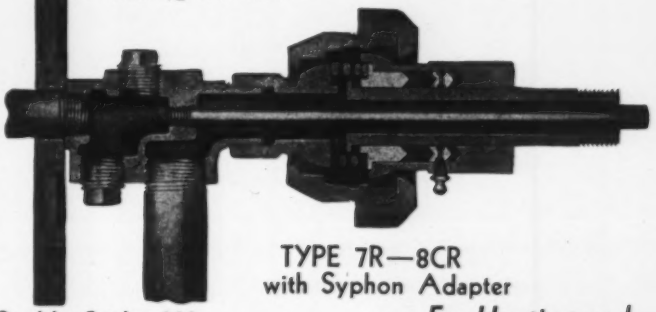
McGILL Bearings are precision-built, adaptable to any engineering problem, and serve all types of mechanical equipment.

McGILL MANUFACTURING CO., 1100 N. Lafayette St., Valparaiso, Ind.

BARCO Revolving Type JOINTS

Prove Their Efficiency By Low Power Cost

Sizes ½ to 3" inc.



TYPE 7R—8CR with Syphon Adapter

Flexibility All Directions

Send for Catalog 292

LEAK PROOF on Air—Steam—Water

For Heating and Cooling Rolls, Drums and Dryers

BARCO MANUFACTURING CO.

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BIRTH OF AN ENEMY

Today, even the smallest spark is your potential enemy.

For today, once fire is born it may destroy machinery impossible for you to replace. It may destroy defense materials sorely needed by a hard-pressed nation.

That is why today, as never before, we urge you to seek out and eliminate every *source* of fire. But this alone is not enough.

All-important is to be prepared to put out fires that can and *do* start . . . immediately, automatically, *at the source!* That is the first rule of fire-fighting. And expert fire-fighters the country over will tell you no system will accomplish this more surely—more reliably—and with less water damage than a Grinnell Automatic Sprinkler System.

Grinnell Sprinkler Systems have such a record of trustworthy performance, that they quickly pay for themselves in reduced insurance premiums . . . then return them "cash dividends".

Built as a complete system by the world's leader in fire protection, a Grinnell System is prefabricated to an engineered layout to meet your special requirements, then installed with minimum disruption. Owners of fifty billion dollars worth of property say it's the best guardian of production and storage. Don't wait until it is too late. Write Grinnell Company, Inc., Executive Offices, Providence, R. I. Branch offices in principal cities.

Where Fires May Be Born in YOUR Plant

1 *At cables with combustible insulation.*
2 *At worn or frayed electrical cords.*
3 *At switches with loose connections.*
4 *Where welding is unsupervised.*
5 *Where open flames are used.*
6 *Where static is generated near flammable vapors.*
7 *At bridged fuses.*
8 *Where sparks are not confined.*
9 *At improperly oiled bearings.*
10 *Where workmen are careless with matches, cigarettes.*
11 *Where spontaneous ignition is possible.*
12 *At dirty flues and ducts.*
13 *At dirty, oily or overloaded motors.*
14 *Where light bulbs contact combustibles.*
15 *Where flammables are used for washing machine parts.*

GRINNELL
AUTOMATIC SPRINKLERS
For Production Protection

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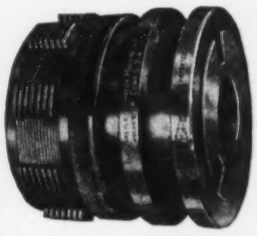
running in neutral with the minimum of drag, abrasion or heating; and a unit which can be manually adjusted with ease by simply lifting the locking spring.



These clutches are particularly adapted for installation in machine tools and for use in all industrial machinery requiring clutches ranging in capacity from $\frac{1}{2}$ H.P. at 100 R.P.M. up to 5 H.P. at 100 R.P.M. The maximum working torque range covered by this line of clutches is from 27 to 263 foot pounds.

Bulletin, Series No. 2, shows single as well as double types, in four sizes. These clutches are made wet plate as well as dry plate.

Welded Test Jack Speeds Weld Tests

The training of hundreds of new welding operators throughout the country to meet war demands has made it necessary to test the work of new welders faster than ever before and at the same time more carefully.

To speed tests of welds, technicians at the B. H. Leonard Welding School of St. Louis, Missouri and the Midwest Piping and Supply Co., designed the all welded test jack shown herewith.

The device, a front view of which is shown, consists of a sturdy frame built around a hand-operated hydraulic jack. It is used for making free-bend, side-bend, and back-bend tests on weld coupons. The organization uses it as standard equipment for testing arc welding operators on field construction jobs.

The design, which was arc welded with equipment supplied by The Lincoln Electric Co., Coit Road and Kirby Ave., Cleveland, Ohio, was made from scrap pieces of steel. According to B. H. Leonard, owner of the welding school and supervisor of welding at the Midwest concern, the project was an inexpensive, fast-fabricating job which required a minimum of machining.

The hydraulic jack used is rated at eight tons, so the frame had to be sturdy to stand the strain.

In the illustration the male member of the guide-bend die may be seen forcing the $^3/_8$-inch thick standard test coupon into the female side of the die.

Midwest engineers calculate that the weld strength of the frame is 100%, as compared to 80% in other types of construction.

The side and top members of the frame were made of mild steel, 6 inches wide and $^1/_2$-inch thick. The side pieces are approximately two feet long and the top members 9 inches. The bottom base plate is 9 inches square and 1 inch thick.

The male member of the die is $1^1/_2$ inches by 2 inches by 6 inches. The upper end was machined on a $^3/_4$-inch radius and the lower end welded to the upper surface of the jack.

The female part of the die also was 2 inches thick and its curved portion was machined on a $1^3/_{32}$-inch radius. The lower corners of the female portion of the dies were rounded off as shown.

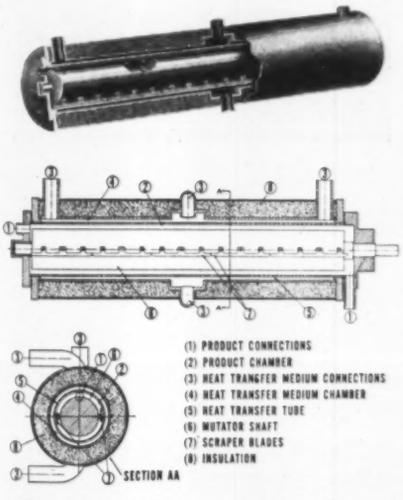
The welding school executive said that a project of this type again illustrated the advantages of welding over other forms of fabrication. There were no holes to drill or punch and the parts did not have to fit accurately at the ends, permitting the use of scrap material.

The school used one of their 30 Lincoln welders on this job.

New Applications Sought for Unique Heat Transfer Medium for Liquids and Viscous Materials

Wider markets are being sought by the Votator Division of The Girdler Corp., Louisville, Ky., for a highly efficient, continuous, closed type of heat transfer mechanism for liquids and viscous materials.

The unit—known as the "Votator"—has been employed heretofore as an integral part of complete processing equipment manufactured by this company for a special group of industries.



The unique basic features of the "Votator" are—continuous operation under pressure in a closed system, and extremely rapid rate of heat transfer. The latter feature results from the high ratio of heat transfer surface to volume of material. These patented principles, are illustrated in the accompanying drawings.

One illustration shows a cut-away view of the entire unit. The diagrammatic drawings show both horizontal and end cross-sections. The sections of the Votator indicated by the numbers are as follows: (1) Product connections. (2) Annular space through which product passes. (3) Heat transfer medium connections. (4) Annular space through which heat transfer medium passes. (5) Heat transfer tube. (6) Mutator shaft. (7) Scraper blades. (8) Insulation.

With only a thin wall separating the product from the heat transfer medium, the rate of heat transfer is extremely fast. The action of the revolving scraper blades quickly removes the film from the wall, thus continuously exposing the heat transfer surface to the incoming product.

This feature of high ratio of heat transfer surface to volume, and the continuous, closed operation of the mechanism, offer many important and exclusive advantages not found in other systems, according to the manufacturer.

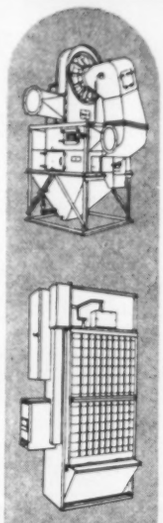
The process makes it possible to get extremely high K value, uniform temperature throughout the product and accurate temperature throughout the product and accurate temperature control. The high ratio of surface to volume permits change in temperature of the product through a wide range in the shortest possible time—usually a matter of a few seconds. The heat transfer is so rapid that many products can be super-

Continued on Page 26

Air Borne

DESTRUCTION

CAN COME IN INDUSTRY TOO!



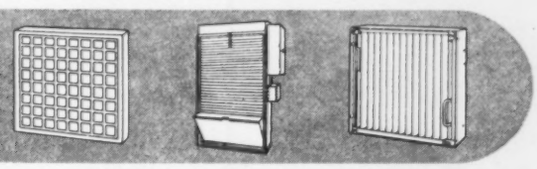
Dust—like enemy Paratroops—is an air-borne menace which, unless controlled, destroys materials, finished products, and man hours of work.

Industry and the war emergency can no longer afford the delay and loss which dust imposes on the nation's productive capacity. So today—more than ever—clean air is recognized as an ***industrial necessity.*** Practically every new defense plant has been supplied with AAF air filtration and dust control equipment, and hundreds of additional installations have also been made in existing plants whose facilities are required for war material production.

Write for booklet "AAF in Industry," which tells the story of industrial dust problems and their solution

AMERICAN AIR FILTER COMPANY, INC.
Incorporated
103 Central Avenue Louisville, Ky.
In Canada: Darling Bros., Ltd., Montreal, P. Q.

AMERICAN AAF AIR FILTERS



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cooled well below the crystallization point and discharged from the "Votator" in a liquid state. The scraping and mixing action of the blades assures uniform temperature change in the product as it progresses through the annular space between the mutator shaft and the heat transfer tube.

Products may be heated or cooled without contacting the atmosphere, due to the fully enclosed design of the unit. Conversely, predetermined amounts of gas may be incorporated into the product.

The "Votator" unit can also be used to make a uniform mixture or to emulsify a mixture of products while the temperature is being changed.

Low temperature refrigerants or high temperature steam can be used in the "Votator" for the heat transfer medium. The metal jacket surrounding the heat transfer medium is heavily insulated, and the entire tube assembly is protected by a substantial metal cover.

As indicated in the diagrams, the arrangement of the connections for the product and for the medium permit varied piping hookups, so that the mechanism can be incorporated into virtually any flow system.

Multiple assemblies, as shown in the accompanying flow diagram, may be used for both heating and cooling the product in a few seconds. The company is prepared to produce the mechanism in standard sizes and designs to fit the needs of many processes that warrant production on a quantity basis—as well as to meet certain requirements that may call for individually engineered units.

While the new applications that are being sought are obviously not confined to the food field, the "Votator" heat transfer mechanism has been known for many years in the vegetable shortening, margarine, lard and ice cream industries—where it has achieved spectacular success in improving the quality and uniformity of these products, and in cutting refrigeration and production costs.

Currently, numerous experimental and pilot plant tests are being made that demonstrate the equal efficiency of this continuous, closed unit for heating, cooling and mixing many other types of liquids and viscous materials.

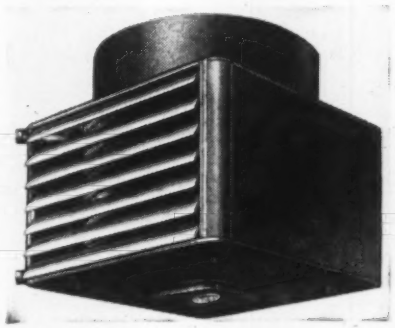
Heat Diffusing Units

A new series of specification information for heat diffusers is announced by Carrier Corp., leading air conditioning manufacturers of Syracuse, N. Y. The four models are designed to provide economical heating for large spaces such as factories, warehouses, hangars, garages, armories, gymnasiums and similar buildings.

An outstanding feature of the Carrier Type 46 Heat Diffusers, according to E. T. Murphy, Vice President in charge of Marketing, is the fact that the units are built in sections for ease in handling, decreased erection cost and convenience in installation. Sectionalized construction permits the adaptation of a single unit to a variety of positions and also permits the conversion of one type of unit into any of the other types after installation. Type 46 Carrier Heat Diffusers come in floor mounted, (Type 46Q), vertical suspended—upright or inverted—(Type 46P) and horizontal suspended units (Type 46R). Either legs or the necessary supporting clips are provided. Three models do not require floor space.

Blower or centrifugal type fans are employed, either belt driven or connected to the motor, providing a wide range of speeds and

capacities. A variety of outlets is available so that proper warm air distribution may be obtained without the use of duct work.



The Carrier Heat Diffusers can also be installed with the Thermadjust feature, which is the most economical control for unit heaters. The Thermadjust employs by-pass dampers to regulate the volumes of heated and by-passed air in order to balance the heat output of the unit with the heating requirements of the space. The dampers may be operated automatically or by hand. The Thermadjust provides for continuous operation of the fans to maintain constant air circulation and uniform temperature conditions throughout the heated space and assures a substantially lower discharge temperature of the air delivered from the outlets, thus providing exceptional fuel economy.

Corrosive and Incrusting Water Supplies Deaerated by Atomization for Boiler Feed

Atomizing deaerators spray the water and then atomize it by means of a steam jet to remove any remnant trace of oxygen. Trays, which may be fouled by high carbonate hardness, are eliminated in this deaerator design.

The atomizing deaerator for stationary work is recommended: (1) where the water is turbid and contains carbonate hardness that might readily foul tray type deaerators. (2) where the water to be deaerated is high in carbon dioxide (i.e., low in pH value), which might cause rapid deterioration of the cast-iron trays.

No differentiation is made between the atomizing deaerator and the tray type from the standpoint of performance.

A Michigan central-heating installation was the first large capacity atomizing type deaerator manufactured and it was selected in place of a tray type deaerator due to the high maintenance on tray heaters. Rusting and deterioration of trays had been caused by the low pH value of the boiler feed water which is zeolite-softened and then treated with sulphuric acid to reduce the alkalinity. The condition of this water and results that have been obtained are illustrated in Cochrane Publ. 2965, "Deaeration by Atomization."

Continued on Page 28

IF YOU NEED **A Lubricant of Increased Load Carrying Capacity**

USE **"STURACO"** ★★★★ *EXTREME PRESSURE ("EP")*

MACHINERY OILS & GREASES

• Here is the answer to many of your lubrication problems caused by today's production demand of heavy loads, high speeds, and continuous operation of machinery and machine tools. "Sturaco" EP Oils and Greases, without any change in your accustomed viscosity or consistency, offer a minimum of *300% increased load carrying capacity* with notable low torque.

Lubrication of ways — spindle bearings — gear heads — elevating screws — speed reducers — are typical examples where "Sturaco" application has solved tough lubrication problems. If you need help, write or phone today.

• • •

SEND FOR the new "Sturaco" booklet outlining laboratory research behind this genuine development, describing typical applications and listing various grades.

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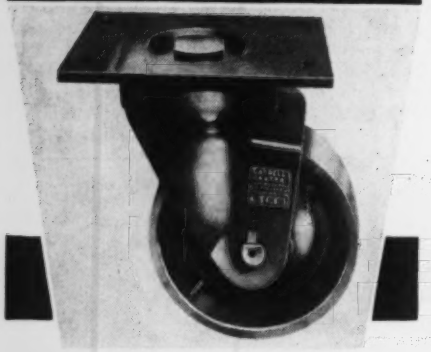
Darnell
CASTERS & WHEELS



SAVE EQUIPMENT . . .
Floor wear is reduced to a minimum—costly floor replacements and repairing practically eliminated.

SAVE FLOORS . . .
No wracking of equipment due to stubborn, hard-to-roll casters. Darnell Casters "always swivel and roll."

SAVE TIME . . . . .
Speed up inter-departmental movement of products and materials . . . increase efficiency of employees.

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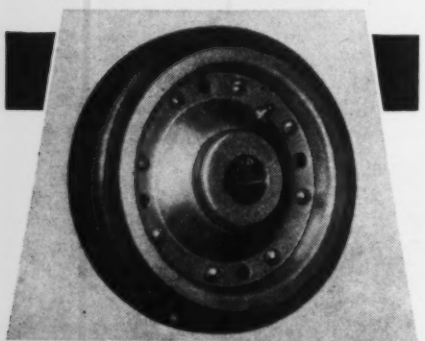
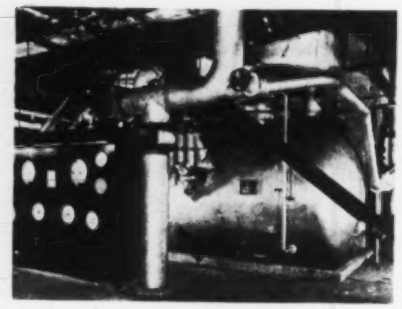
KEEP TURNING AND EARNING



Darnell Corp., Ltd.
LONG BEACH, CALIFORNIA
36 N. CLINTON ST., CHICAGO
60 WALKER ST., NEW YORK CITY

• Keep Informed . . .

A 400,000 lb. per hour vertical unit was purchased by another Michigan industrial plant instead of a competitive tray type of heater on the basis of these test results. The excellent performance of this atomizing type deaerator has since been confirmed. With the installation of the atomizing type of unit the

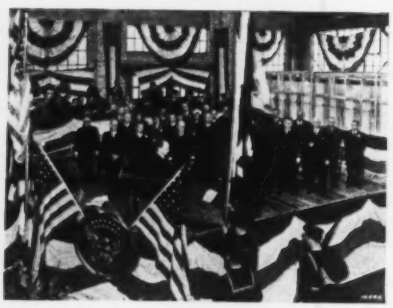


internal structures have been notably free of corrosion and deterioration, at the same time time delivering zero oxygen water. Two 500,000 lb. per hour atomizing deaerators are now operating in Texas and another 400,000 lb. per hour unit has been installed in the above-mentioned Michigan industrial plant.

The Union Electric Light Company of Missouri installation illustrated was recommended to deaerate 100% makeup water previously treated through a cold process softener. When such water is heated, there is likely to be precipitation which will interfere with deaeration in the trays. The atomizing type deaerator has a considerable advantage in view of the fact that water of this type can be deaerated without interference as exemplified by its application to Cochrane deaerating hot process water softeners.

Kropp Forge Co. Receives Navy's Bureau of Ordnance "E" Award

Naval pomp and circumstance attended the formal presentation of the U. S. Navy's Bureau of Ordnance "E" Award to the Kropp Forge Co., 5301 West Roosevelt Road, Chicago, Ill., Saturday afternoon, February 28. Before an audience of over 2,500 employees and their families and guests, Rear Admiral John Downes, USN, commanding officer of the Ninth Naval District, placed the coveted flags significant of "outstanding efficiency in the production of ordnance material" in the hands of Roy A. Kropp, president of the company. The great plant which is working twenty-four hours a day in a seven-day week shut down from noon to 5 P.M. for the ceremonies.



In his address, John B. Hawley, Jr., president of the Northern Pump Co., Minneapolis, Minn., chairman of the meeting, commented on the fact that for the first time in months, every machine was idle. "This represents a halt in production at a time when every moment counts, but I am confident that the inspiration of this day will make up many times for this pause. It means a great deal to realize that this recognition has come to Kropp Forge when in the words of one of the greatest heroes of the American Navy, 'We have just begun to fight!' "

Chairman Hawley praised the shopmen for their proven ability to "move fast and move effectively" and commended the Kropp executives for their foresight and patriotism.

Admiral Downes, who was accompanied by his staff from Great Lakes, and was piped aboard by a 25-piece navy band from that station, called attention to the fact that uniforms had lost much of their significance in this all-out war—that die makers and welders and hammersmiths and a myriad of other workers had become vital factors in achieving victory. "Nowadays, with production holding the important place it does, it is not improbable that major battles—the unknown, unsung ones—will be fought out in machine shops, shipyards and engineering laboratories," he said.

Admiral Downes went on to say that it was possible for the United States to lose this war through military negligence, an assembly line's slow-down or by wishful thinking. "Blueprints don't win wars," the veteran sea dog declared. "Today, more than ever, there is an impressive truth in the expression 'for want of a ship, a world can be lost.' We must do more than equal, we must outstrip enemy production."

Roy A. Kropp, president of the Kropp Forge Co., responded to the Admiral's address in a short speech in which he feelingly praised his employees and associates for their loyalty and tireless efforts in the program for defense. In an impressive ceremony, he received the Bureau of Ordnance flag and "E" pennant from Admiral Downes. As the color guard posted them, the Navy band played "Anchors Aweigh."

Governor Dwight Green, who was unable to be present, sent the Hon. David Shillinglaw as his official representative. He complimented the Kropp Forge Co. on its splendid contribution to Illinois' record in national defense. Jerry Stunf, oldest Kropp employee, receive loud applause for delivering his remarks without notes and for pledging the workers to redouble their efforts to "keep 'em hammering."

Capt. E. A. Lofquist, USN, Chief of Staff for the Ninth Naval District, presented "E" pins to executives and members of the "25-Year Club" made up of employees with a quarter-century of service.

Members of Admiral Downes' staff presented similar pins to each of the almost 600 employees.

Telegrams of congratulation were read from Secretary of the Navy Frank Knox and Rear Admiral W. H. P. Blandy, USN, Chief of the Bureau of Naval Ordnance, Washington, D. C., and others. High officers of the army and marine corps were present as guests of the navy men and Kropp Forge.

A banquet for naval officers, plant executives and industrial leaders was held Saturday evening in the Union League Club.

All-Purpose Car Puller

Wherever cars must be spotted for loading or unloading, this streamlined and proved car puller will handle from two to three cars with ease. A large vertical capstan permits pulling in any direction.

It is stated that this versatile unit can also be used for docking barges, handling indus-

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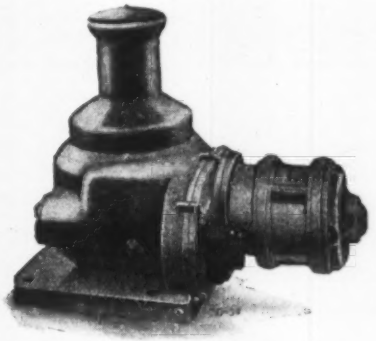
trial cars in lumber yards, foundries; in fact wherever heavy materials are handled.



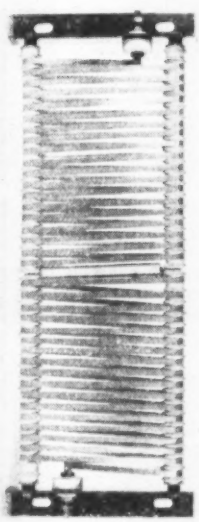
Capacity—2 to 3 cars

With one-man operation and low initial cost, the Jeffrey car puller will soon pay for itself. A 5 H.P. ball-bearing motor, weatherproof and protected against overload, furnishes the power.

Complete data can be had by writing The Jeffrey Manufacturing Co., 904-99 No. Fourth St., Columbus, Ohio.

New Air Heater for Ovens

For heating ovens or furnaces used in annealing of aluminum, glass, and other materials, a new air heater is announced by Westinghouse Electric & Manufacturing Co.



Designed for temperatures of from 750 to 1150 degrees Fahrenheit, the unit has a heating element consisting of a one piece nickel-chrome ribbon, spirally wound around heavy porcelain insulators. Rating is 5 kilowatts for operation on 220-volt circuits. The complete heater is only $2\frac{1}{2}$ inches thick and requires a space 12 by 33 inches for mounting.

Newly Improved Paper for Ammonia Dry-Developed Prints

The Frederick Post Co., Chicago, has recently greatly improved their ammonia dry-developed printing paper—VAPOpaper. The new VAPOpaper develops a deeper, sharper blue or red line print on a clean white background.

A very important feature of the new VAPOpaper is that every roll in the same shipment or different shipments is entirely uniform both as to speed and color. Print-

Continued on Page 30

A One Minute Quiz That May Result in Savings for Your Plant

(and at the same time help to conserve defense materials)

***Q.* What is manganese steel?**
A. Genuine manganese steel is an alloy of manganese, carbon and iron, containing 10.0 to 16.0% (usually 13.0%) manganese, which is austenitic after heating and quenching. So-called "manganese steels" containing 1.5 to 2.0% manganese do not have the same properties.

***Q.* Briefly, what is the history of manganese steel?**
A. (a) Discovered by Hadfield in England in 1882. (b) Introduced in America in 1892. (c) First made by Amsco in 1906. (d) First produced in the electric furnace in 1919. (e) Still "The Toughest Steel Known" in 1942.

***Q.* What are the physical properties of cast heat-treated standard manganese steel?**
A. High tensile strength and ductility, unequalled toughness and work-hardening property. See Page 10 of Amsco Catalog No. 59.

***Q.* Is manganese steel hard?**
A. Its initial hardness (185-200 Brinell) is little greater than that of ordinary cast steel, but under repeated impact the surface hardness increases immensely, reaching at the point of embrittlement a maximum of 550 Brinell. *The surface hardness so obtained is continuously renewed so long as the service continues, while the body metal retains its original toughness.*

***Q.* Is manganese steel brittle?**
A. As cast, before heat treatment, it is as brittle as cast iron, but after heating and quenching it has a greater toughness than any other steel.

***Q.* Why is manganese steel tougher than any other steel?**
A. The extremely cohesive structure known metallurgically as austenite, acquired from the heating and quenching process, is in manganese steel very strong and ductile, which two properties combined constitute toughness.

***Q.* Why is manganese steel so remarkably wear resistant under impact and abrasion?**
A. The metal structure becomes increasingly hard and "set" in the areas stressed, in proportion to the repetition and severity of attack. Without such cold-working it is about as abrasion resistant as tool steel or chilled cast iron.

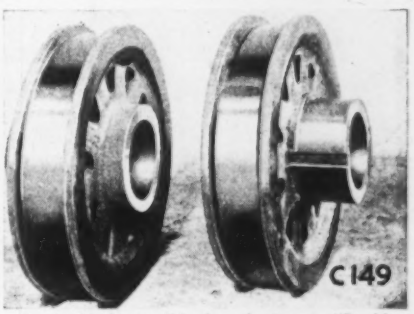
***Q.* Why will manganese steel resist shock stresses?**
A. Because its high tensile strength and unusual ductility in combination, meaning toughness, enable it adequately to resist shock stresses and yet to yield or deform under heavy impacts rather than to break. Such deformation, however, is not continuous because cold-working raises the yield strength in stressed areas.

***Q.* Can manganese steel be welded?**
A. For building up to compensate for wear, manganese steel can be welded with nickel-manganese steel welding rod; and for repairing fractures either that rod or stainless steel rod is successfully used. Less care is necessary, to avoid degradation by extensive overheating, on nickel-manganese steel parent metal than on standard manganese steel. It can be hard-surfaced.

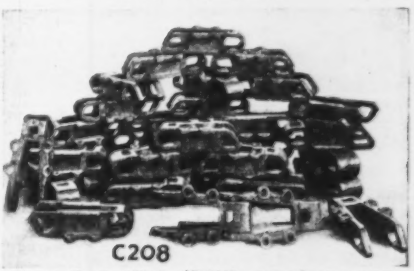
***Q.* Can manganese steel be machined?**
A. Standard manganese steel can be cut with special tool steel or cemented carbide tools, but special technique and equipment are required. Attempting to tool by ordinary methods merely results in work-hardening the steel at the point of contact and wearing out the tool with little result. Practically all machining on manganese steel is done by grinding.

***Q.* What special value has manganese steel?**
A. Wherever metal is required to combat abrasion associated with heavy repeated impact, standard manganese steel resists breakage much better than ordinary steel and usually has from twice to ten times the wearing life.

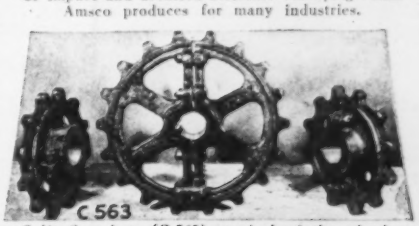
***Q.* What industries use manganese steel?**
A. Among others, cement, clay products, coke and iron, construction, dredging and excavating, foundry, glass, logging, mining, petroleum, quarry, sand pit and steel.



Overhead Crane Wheels of Amsco "Double Wall" Design. (C-149)



Apron Feeder Chain (C-208)—one of many types of impact and abrasion resistant conveying chain Amsco produces for many industries.



Split Sprockets (C-563)—typical of the wheels, gears, pinions, rollers made by Amsco for use where shock, wear or heavy loadings are encountered.

Amsco
AMERICAN MANGANESE STEEL DIVISION
OF THE AMERICAN BRAKE SHOE & FOUNDRY CO.
Chicago Heights, Illinois

Manganese Steel Castings for shocks and abrasion.
Chromium-Nickel Alloy Castings for heat and corrosion resistance.
Power Shovel Dippers. Dredge and Industrial Pumps.
Welding Materials for reclamation and hard-surfacing.

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Continuously Variable Speed Control with OHMITE Rheostats

Infinite number of Spindle Speeds up to 2500 r.p.m. in Monarch Lathes

This Monarch Machine Tool Lathe provides smooth, continuously variable, wide-range speed control thru the use of Ohmite Rheostats in an all-electric adjustable speed drive developed by the Reliance Electric & Engineering Co. The need for change gears is eliminated. Complete range of speed up to 2500 r.p.m. is obtainable by controlling the speed of the direct current lathe motor with two Ohmite taper-wound "Model R" Rheostats in tandem. ★ Ohmite Rheostats are the "heart" of variable speed control in many applications. Ten wattage sizes from 25 to 1000 watts.

Send for Catalog No. 40

Write on company letterhead for complete, helpful 96-page Catalog and Engineering Manual No. 40.

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RHEOSTATS · RESISTORS · TAP SWITCHES

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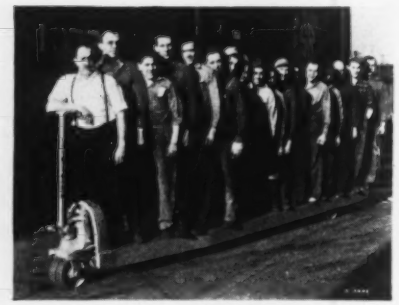
ing and developing machines do not have to be set to conform with the variance of speed in different rolls of paper.

The new VAPOpaper is not only faster but also is tougher. Its 50% rag content basic paper stock enables it to stand up under creasing and hard usage.

A free 5-yard sample is offered those who are equipped to produce ammonia dry-developed prints. In writing The Frederick Post Company, Box 803, Chicago, for your sample state whether you prefer blue or red line VAPOpaper in the regular or fast printing speed. Also state whether or not you are equipped to produce ammonia dry-developed prints.

Yale Delivers World's Longest Hand Lift Truck



The Yale & Towne Manufacturing Co., 4530 Tacony St., Philadelphia, Pa. have just delivered to Johns-Manville & Sons the world's longest Hand Lift Truck. This truck is 168" long and is a special adaptation of the standard Yale Load King Hydraulic Lift Truck. It was specially designed to cope with problems arising in the handling of wall board and roofing.

National Forge Commemorates "E" Award

When the Navy Department awarded the "E" pennant for excellence in production to the National Forge and Ordnance Co. in Irvine, Warren County, Pa., it was an honor of which every man in that large steel forging plant was keenly aware. Realizing that manufacturing as well as wartime history was being made, it was decided to issue an unusually attractive brochure to commemorate the crisp Fall days when the Navy "E" pennant first flew from the company flagpole.

Embossed in gold on the cover and carrying the spirit of the award throughout the inside pages, the book not only was greatly appreciated by all present but has received much interest and commendation throughout the steel forging industry. A limited supply of extra copies permits offering the book to readers of MECHANICAL ENGINEERING who feel prompted to write for one, provided the request is received before the edition is exhausted.

• BUSINESS CHANGES

Woodard Appointed Manager of New Products Division

George H. Woodard has been appointed manager of the new products division of the Westinghouse Electric & Manufacturing Co., F. D. Newbury, vice president, announced.

Mr. Woodard joined the Company when the new products division was created in 1936 for the development of products which have not reached the state of commercial apparatus. After filling the position of new products engineer at the Westinghouse South Philadelphia works for two years, he was brought to the division's headquarters at East Pittsburgh in 1938.

Besides directing development of new products, Mr. Woodard will continue as executive assistant in the Company's emergency products division, responsible for the negotiation of government contracts for ordnance material.

One of the Company's major objectives at present is to provide new products which will carry industry over the post-war period. Prominent among those may be electrical equipment for the aviation industry. Westinghouse now is manufacturing aircraft accessories for military use.

Mr. Woodard was born in Schenectady, N. Y., in 1906; he received his degree in mechanical engineering from Cornell University in 1928 and is a member of the Phi Gamma Delta Fraternity. He also holds memberships in the National Aeronautic Association and the Army Ordnance Association.

Brown Elected A-C Vice President

Edwin H. Brown has been elected a vice president of the Allis-Chalmers Manufacturing Co., in charge of engineering and development, it was announced recently by W. C. Buchanan, president.

Before assuming the new post, in which he will correlate all engineering activities and the development of new products, Mr. Brown was manager and chief engineer of the engine and condenser department for seven years.

Immediately after obtaining his engineering degree from the University of Nebraska in 1906, Mr. Brown entered the Allis-Chalmers training course for graduate engineers. Upon completion of the two year engineer apprentice course, he served in various capacities with the company, and then became assistant manager of the steam turbine department. Mr. Brown became head of the engine and condenser section in 1935. He is married and the father of two daughters.

The administration of the engine and condenser department has been taken over by M. L. Carson, sales engineer.

New Assistant Manager for Allegheny Ludlum's Detroit Office

J. D. McKnight has been named Assistant District Manager of Allegheny Ludlum Steel Corporation's Detroit office, according to an announcement made at the company's Pittsburgh offices by Russell M. Allen, General Manager of Sales.

The appointment follows six years of sales experience for Mr. McKnight with Allegheny Ludlum, starting in 1936 when he joined the Detroit staff of the former Allegheny Steel Company. Prior to that time, since 1930, he had been connected with the Murray Corporation of America, Detroit, in various plant and sales capacities. In his present position, Mr. McKnight will assist H. N. Arbuthnot, manager of Allegheny Ludlum's Detroit office.

D. H. Lauder Appointment

D. H. Lauder, for the past six years engineer of General Electric's Pittsburgh office, has been appointed assistant to W. M. Denny, assistant manager of the company's Contract Service department at Schenectady. This announcement was made today by F. P. Wilson, manager of the department.

Mr. Lauder is a native of Lonaconing, Md. He was graduated from the University of

Pittsburgh in 1922 with a B.S. degree in electrical engineering, and in September of that year entered General Electric's Test course at Schenectady as a student engineer. He also did test work at the G-E plant in Pittsfield, Mass.

In 1923 Mr. Lauder became a foreman of the company's outside installation force, Pittsburgh. Six years later he was named assistant to the local engineer of the G-E office there, and in July of 1936 was appointed local engineer.

Appointed Cochrane Representative

Power Specialty Co., Houston, Texas, has been appointed to represent the Cochrane Corp. in southeastern Texas for the sale, installation, and service of Cochrane meters. In addition to handling the Cochrane meter line, the Power Specialty Co. also handles the products of Centrifix Corp., Erie City Iron Works, Hays Corp., J. E. Lonergan Co., and the Lummus Co.

To Handle Cochrane-Becker Return System

V. L. Sanderson, Philadelphia, and his associate, William Bradford, Wilmington, Del., have been appointed sales representatives in eastern Pennsylvania, southern New Jersey, Delaware, and Maryland for the new Cochrane-Becker high-pressure condensate return system. In addition to the Cochrane-Becker system, Sanderson-Bradford handle Ajax shaft couplings, Okadee quick-action valves and blow-off valves, Pittsburgh Lectrodryer dehumidifying apparatus, Rhode Island Humidifier systems, Stets boiler and evaporator level controls, and Stock Engineering coal-handling equipment.

• LATEST CATALOGS

Welding, Brazing and Soldering Fluxes

The tremendous importance of fluxes has gradually become recognized by men concerned with welding, brazing and soldering metals.

Long ago the theory of "one flux for all purposes" was exploded. Both scientific experiments and practical experience showed that joining one metal presented different chemical and metallurgical problems than joining another. Consequently, a large number of fluxes have been developed . . . each one particularly suited to a given application.

Naturally, the selection of the particular flux which will produce a perfect bond on the job at hand is most important . . and frequently difficult. The new Krembs Chart is almost indispensable to anyone doing welding, brazing, or soldering. It gives quick answers to over 400 fluxing questions, and at the same time, is practical and easy to use. It is based on 75 years of experience in solving metal joining problems. Metal working concerns may obtain complimentary copies by writing on their letterheads to Krembs & Co., 666 West Ohio Street, Chicago, Ill.

New Ampco Bulletins

"Ampco Metal Centrifugal Castings" and 'Ampco Metal in Bushings and Bearings" are two new bulletins issued by Ampco Metal, Inc., Milwaukee, Wis., producers of alloys of the aluminum bronze class.

Each bulletin is letter-head size, six pages in length, and well-illustrated.

"Ampco Metal Centrifugal Castings" describes the process of casting by this method and lists the benefits the customers derive through the use of this method of casting. Centrifugally cast parts are illustrated, as well as a number of views of metal being produced by the centrifugal method.

"Ampco Metal in Bushings and Bearings" contains a discussion of the advantages of using these parts made from Ampco Metal. Case histories are cited to point out the merits of the bronze in actual service. Illustrations of typical parts are included.

Copies of these bulletins will be sent to those interested in the subjects discussed.

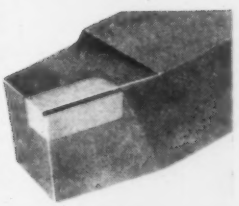
Aluminum Bronze Welding Rods

A new catalog, just issued by Ampco Metal, Inc., Milwaukee, Wis., describes in detail the welding technique and application of Ampco-Trode coated aluminum bronze welding rod, suitable for metallic arc, carbon arc, and oxy-acetylene welding. Since the first announcement of the rod a year ago, considerable strides have been made by Ampco engineers in broadening the use of the rod. Improvements have been made, also, to the coating, until, today, even a welder, unfamiliar with aluminum bronze rods, can get deposits without porosity.

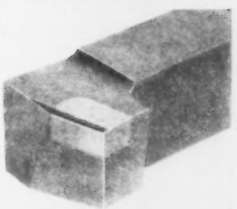
Continued on Page 32

How the Greater Hardness of KENNAMETAL

INCREASES PRODUCTION
REDUCES TOOL COSTS



STYLE 11 TOOL



STYLE 21 TOOL

THE Rockwell hardness of a tool material is not a complete indication of its ability to resist wear. A KENNAMETAL tool tip of the same Rockwell hardness as another carbide will actually machine more pieces per tool grind and last longer because of the greater hardness of the *individual particles* of tungsten-titanium carbide in the tip. This has been proven by comparative tests on jobs in production.

Here is what the greater hardness of KENNAMETAL means to users of turning, boring and facing tools for machining steel parts:

Less Down Time for Replacing Dull Tools
Lathes and boring mills are kept productive during longer periods of time.

Less Time for Grinding Tools
Eases the burden on men and machines in the grinding department.

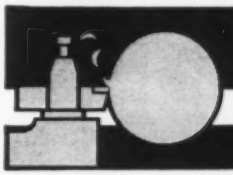
Less Tool Inventory
Fewer tools needed to replace dull tools and tools which have worn out.

RECORD SALES PERMIT PRICE REDUCTIONS

Despite the fact that KENNAMETAL is harder, stronger, and more "crater-resisting" than other steel-cutting carbides, it costs no more. You need pay no extra to use the best. Write for Price List No. 7 containing new low prices on KENNAMETAL tools and blanks, effective Jan. 5, 1942. Do you have our Catalog No. 42?

KENNAMETAL
The Accepted
STEEL CUTTING
CARBIDE

SALES REPRESENTATIVES FROM COAST TO COAST



McKENNA METALS Co.
367 LLOYD AVE., LATROBE, PENNA.
FOREIGN REPRESENTATIVES: U. S. STEEL EXPORT CO.
(Exclusive of Canada, Great Britain and Possessions)

Canadian Agent: Kennametal Tools & Mfg. Co., 24 Dunbar Ave., Hamilton, Ont.

3 IMOs in fuel oil burner service; 43 g.p.m. each against 300 lb. per sq. in.

IMO holds a steady oil pressure

The three rotors of the De Laval-IMO oil pump propel the oil forward uniformly, as would a piston moving always in one direction. The fact that there is no pulsation is valuable in oil burner, lubrication or hydraulic pressure service.

The three moving parts are in perfect rotational and hydraulic balance, and the pump can be coupled to a standard speed motor or turbine. There are no valves, separate bearings or timing gears.

Write for Catalog I-80.

IMO PUMP DIVISION
of the
De Laval Steam Turbine Co.
Trenton, New Jersey

• Keep Informed . . .

Among the applications covered in the new book are welding on Ampco Metal, brass and bronze, steel, cast iron, alloy steels, and nickel alloys, by various methods. General welding instructions are given, so that the welding engineer has a comprehensive knowledge of the technique of welding with aluminum bronze rods.

The new book is well illustrated with drawings of welding methods, photographs of typical beads, and X-ray views. Six grades of Ampco-Trode are described and illustrated with photomicrographs. The Ampco-Trode catalog is 16 pages, letterhead size, and printed in two colors.

Copies will be sent free to welding engineers interested in learning more about aluminum bronze rods.

Spencer Turbo-Compressors

A new bulletin has been recently published by The Spencer Turbine Co., of Hartford, Conn., on turbo-compressors. The information includes performance curves, application and installation data, and a complete list of ratings with pressures from 4 oz. to 5 lbs. and volumes up to 20,000 cubic feet per minute.

Air Conditioning

A new condensed catalog covering air conditioning, refrigeration and space heating equipment manufactured by the company has just been published by Carrier Corp., pioneer air conditioning concern.

Profusely illustrated, and containing detailed specifications, the catalog is divided into sections describing self-contained Weathermakers, and equipment for summer and winter air conditioning, dehydration, year around air conditioning, refrigeration, low temperature air conditioning, and industrial and commercial heating.

Of particular interest to those planning large scale building projects, are the Weathermaster units described in the catalog. Used with standard high velocity central station systems, the Weathermaster combines in one unit the functions of winter heating and summer cooling, the catalog points out.

Among the other equipment described are the various centrifugal refrigeration machines available. It was this type of machine that made possible large scale air conditioning.

Copies of the new catalog may be obtained by addressing Carrier Corp., Syracuse, N. Y.

Ampo Issues Revised Bronze Table

Ampco Metal, Inc., 1745 South 38th St., Milwaukee, Wis., has just issued a revised "Table of Bronze Specifications to Government Requirements" which lists in parallel bronze specifications that are largely used by government contractors. This useful table lists all the alloy grade numbers cast by Ampco to these various governmental specifications. Chemical composition of each alloy is given for ready reference. Sent free on request.

Deaerator Control System

The Brown Instrument Co., Philadelphia, Pa., has just issued a new Bulletin No. 29–34 —"Brown Deaerator Control System." Modern boiler operation demands the removal of dissolved air from boiler feed water to prevent pitting and embrittlement. There are many variables that effect load change on the boiler, and any load change that causes pressure variations in the Deaerator will decrease the efficiency of the dissolved air removal from the feed water.

This new bulletin describes the Brown Remote New-Matic Deaerator Control System which provides automatic control of the Air-o-Line type. Air-o-Line control has throttling action to correct steam input according to surges of pressures or flow, and reset action to compensate for load changes. Included are descriptions of the principles involved and application data. Schematic diagrams show how the system is hooked-up for boiler operation.

A copy of this bulletin may be secured by writing to the Brown Instrument Co., 4486 Wayne Avenue, Philadelphia, Pa., asking for Bulletin No. 29–34.

Evaporative Condensers

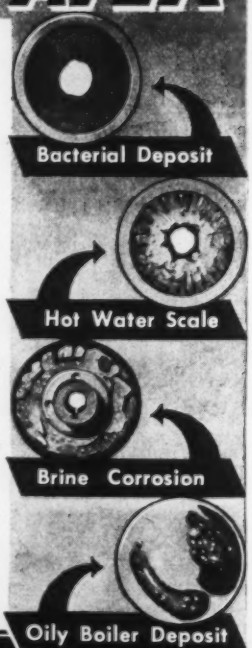
Latest technical information on Carrier Type 9Q evaporative condensers is contained in a series of leaflets just issued by Carrier Corp., Syracuse, N. Y. The publications describe equipment designed to supplent water-cooled condensers and water-cooling towers in refrigerative systems and also to cool liquids in various industrial applications.

Described in the leaflet is a compound for treating the water used as spray to decrease the possibility of scale formation and corrosion of metal parts in contact with the water.

Electric Strain Gages

An eight-page booklet (GEA-3673) recently issued by General Electric Co., Schenectady, N. Y., describes electric gages available for measuring mechanical strains. In an interesting and easily understandable manner, this well-illustrated booklet describes the different types of gages available, and discusses their operation.

what WE READ in WATER



There are a great many stories that can be read in the various samples of water we receive. They tell of scale and corrosion in varying degrees of destructiveness. Water for cooling systems, steam and return systems, refrigerating brines . . . each has its particular story. Power plants, petroleum industries, process industries, public buildings and transportation industries . . . all have their problems.

Let us study these problems for you and tell you how Chrom Glucosate, Phospo Glucosate, and many others of our Haering products can correct these conditions, saving your materials and increasing the production of your plant.

Write for these interesting booklets:

"Organic Methods of Scale & Corrosion Control"
"Cooling Waters" • "H-O-H Lighthouse Reprints'
"The Solution of Your Proportioning Problem"

and other booklets on water treatment for Power Plants, Refrigeration Plants, Petroleum Industries, Process Industries, Public Buildings, and Transportation Industries.

D. W. HAERING & CO., INC.
GENERAL OFFICES: 205 West Wacker Drive
CHICAGO, ILLINOIS

Stating that the field of application for strain-gage equipment is almost unlimited, the descriptive bulletin goes on to list a few examples of types of stress investigations that can be made. Included among these are the determination of stresses on bridges, tanks, and structural parts; stresses in the rails of railroad tracks; housings of rolling mills; locomotive running gear; beams of shovels and cranes; aircraft structures while in flight; ship hulls and structures; frames of trucks and automobiles. Also for indicating peak stress in connecting rods of large punch presses and press brakes; for indicating the maximum permissible load on the rolls of roll-bending machinery; and for the determination of stresses in gun carriages caused by gun recoil.

New Bulletin Describes Motor and Control Manufacture

The manufacture of motors and controls for general industrial use is described in a new 32-page catalog announced by Westinghouse Electric & Manufacturing Co.

Designed to show the many phases of research, production, and testing of motors and controls, a number of photographs are used to illustrate most of the scenes that would come to the attention of a visitor going through this department of the East Pittsburgh works. Mass production of precision parts, multiple dipping and baking, and foundry operations are among the procedures described and illustrated.

Line assembly and testing of controls is covered pictorially, showing how precision tools and gauges coupled with operator skill contribute to accurate and rapid production. Material handling layouts show use of conveyors and arrangement of parts for assembly.

A copy of booklet A-3023 may be secured from department 7-N-20, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

Interchangeable Ball Bearings For Replacement

This book just issued by New Departure, Division of General Motors, supersedes older editions and contains a listing of all standard New Departure Ball Bearings together with the bearing numbers of competitors' bearings with which they will interchange.

This information is extremely vital to those who must replace bearings both in automobile and machinery, now that bearings of all makes are difficult to obtain, due to a concentration of all bearing manufacturers on war work.

Ask for Booklet R, Form No. A-58, from the general office, United Motors Service, Inc., General Motors Building, Detroit, Mich.

New Indexing and Free-Wheeling Clutch

Morse Chain Co., Detroit, Mich., announces free offer of new 6-page Indexing and Free-Wheeling Clutch Bulletin No. K-6. It covers Clutch applications for indexing, free-wheeling, and backstop operations. Shows how closer tolerances and rate of feed can be greatly increased in drive feed roll indexing operations such as punching, forming, shearing, etc. Clutch backstop installations are given for maintaining directional shaft rotation. Explains practical, efficient multi-engine combinations, plus other single and multiple prime mover hook-ups for driving a common load and tells how clutches automatically function in such installations. In well illustrated form it presents principles, characteristics, advantages and detailed construction of Morse Indexing and Free-Wheeling Clutch lines. Gives diagrammed and charted engineering data including power-speed ratios, load capacities, complete dimensions, and prices. Made up in quick, ready reference form.

Control System for Superheated Steam

A control system which is said to be enabling many steam plants to run superheated steam right up to the top safe limit, and to hold it there steadily, is described in a 16-page catalog just issued by the Leeds & Northrup Co.

This new publication describes how the system—Micromax Electric Control—detects each temperature drift from the control point, and swiftly readjusts damper (or valve) to head off the departure in minimum time . . . an action which is so fast and direct that operating efficiency is bettered and costly equipment protected from damage.

Schematic diagrams show how the control is being applied to different types of boilers. Reproductions of chart records illustrate actual operating results. Described, too, is the ease with which operators are said to take over on manual control . . . then switch back to automatic operation without delay.

Also pictured and described is a supplementary control for topping units which acts

Continued on Page 34

In Industry, In Defense
PITMAN Engineering BOOKS

For Top-Flight Design, High-Speed Production, Expert Maintenance

WOOD TECHNOLOGY — Tiemann (U. S. Forest Products Lab.)
Comprehensive new study of phases, processes and utilization.
Cloth, 6″ × 9″, 326 pp., 129 illus., $3.50.

MODERN PLYWOOD — Perry (Organizer, Wood Industries Div., A.S.M.E.)
Thorough, authoritative treatment of manufacture and utilization.
Cloth, 6″ × 9″, 380 pp., 195 illus., $4.50.

INDUSTRIAL PLASTICS
2nd Ed., 2nd Printing, Revised. Simonds (Consulting Eng.)
Includes Wartime Uses and all latest types of plastics. Many new applications.
Cloth, 6″ × 9″, 394 pp., illus., $4.50.

GLASS: THE MIRACLE MAKER — Phillips (Corning Glass Works)
History, Manufacture, Chemistry, Mechanical & Physical Properties, Applications.
Cloth, 6″ × 9″, 436 pp., over 200 illus., $4.50.

MODERN METALLURGY FOR ENGINEERS — Sisco (Alloys of Iron Research)
Engineering properties, their variables. Significance of variables to engineers.
Cloth, 6″ × 9″, 432 pp., 180 illus., $4.50.

DESIGN OF MANUFACTURING ENTERPRISES
Rautenstrauch (Columbia Univ.)
Economics of manufacture in design and redesign, with examples from General Motors, U. S. Steel, etc. Mechanical and process industries.
Cloth, 6″ × 9″, 308 pp., illus., $3.50.

MOTION STUDY — Sampter (Blaisdell Pencil Co.)
Basic principles for supervisors and workers as well as executives.
Cloth, 5¼″ × 8″, 151 pp. illus., $1.75.

AIRCRAFT ENGINE MAINTENANCE
Brimm & Boggess (Companion book Aircraft Maintenance)
Every detail of every job performed in maintaining aircraft engines. Used by the U. S. Army, Navy and Coastguard; by all leading schools.
Cloth, 6″ × 9″, 480 pp., over 500 illus., $2.50.

AUTOMOTIVE ENGINE TESTING — Gruber (Douglas Aircraft)
Test procedures common in our major industrial organizations. Used by Ford, Lycoming, etc. Cloth, 6″ × 9″, 447 pp., 238 illus., $4.75.

MODERN AIR CONDITIONING, HEATING AND VENTILATING
Carrier, Cherne, Grant
All facts and formulae needed on every type of application problem. By the pioneer. Cloth, 6″ × 9″, 558 pp., 452 illus., $4.50.

FUELS AND THEIR UTILIZATION — Carr & Selheimer (Wayne Univ.)
Cloth, 6″ × 9″, 184 pp., illus, $2.00.

MECHANICAL VIBRATIONS — Bernhard (Penna. State College)

Send free for the complete new Engineering Catalog!

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2 WEST 45th STREET • NEW YORK

...or in hurtling dives that inspired the name *LOCKHEED LIGHTNING*... reliable fastenings are essential.

To insure the safety and top performance of this great ship, Elastic Stop Nuts are used throughout the construction of the P-38 at bolt and screw connections.

TEST these nuts at *your* difficult fastenings. Samples furnished without charge.

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In ALL BRANCHES of the ENGINEERING FIELD

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EDWARD R. FEICHT
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Chemical and Metallographical Laboratories—Welding ... Supervision, Inspection and Testing, Qualification of Operators and Procedures.
THE JAMES H. HERRON CO., Cleveland, Ohio

Weld Testing—Qualification of Operators—Supervision—Inspection—Research.
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Power Plants, Structures Transmission Systems—Design Supervision, Inspection, Appraisals, Reports.
SARGENT & LUNDY
140 S. Dearborn St., Chicago, Ill.

RATE Announcements under this heading in MECHANICAL ENGINEERING are inserted at the flat rate of $1.25 a line per issue, $1.00 a line to A.S.M.E. members, minimum charge, three line basis. Uniform style set-up. Copy must be in hand not later than the 10th of the month preceding date of publication.

• Keep Informed . . .

automatically, when load drops off, to prevent exhaust steam temperature from rising excessively and damaging the low-pressure turbine.

Anyone desiring a copy of this publication may have it by addressing Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia, Pa., and asking for Catalog N-33-163 (1)—"Micromax Temperature Control for Superheated Steam."

Electric Gaging

Booklet GES-2543, recently issued by the General Electric Co., Schenectady, N. Y., tells in interesting, concise fashion of eleven outstanding instances where savings in both time and money, and at the same time improved quality, have resulted from the application of extremely sensitive yet sturdy electric gaging equipment.

The booklet illustrates such electric gages as the strain gage, pressure gage, film-thickness gage, eccentricity gage, profile gage, electrolimit gages, and the tensiometer. Applications for each are also suggested.

Flexible Pipes for Diesel Installations

Pennsylvania Flexible Metallic Tubing Co., 7206 Powers Lane, Philadelphia, Pa. announce their new Bulletin No. 71 which should be of real interest to all who operate Diesel Engines, afloat or ashore.

It contains the 1942 Standards for All-Metal Flexible Assemblies used by the Diesel Industries for exhaust pipes, air-intakes and supply lines. These are in accordance with the latest recommended practices. It also contains a guide to the requirements of the United States Government Departments, the Navy, Coast Guard, etc. Their couplings Fig. 7008 and 7009 are designed especially to meet the requirements of these new standards.

Solderless Terminal Lugs

The "K & H" Solderless Terminal (Folding, Double Cupped, Washer) Lug, made by Krueger & Hudepohl, 3 East Third Street, Cincinnati, Ohio, provides perfect contact. They are made in various types and sizes so as to meet the requirements of a very large range of applications. They are suitable for use with wires solid or stranded. Bulletin 8-D gives sizes, dimensions and prices. Write for your copy.

Oil Burners

Peabody Engineering Corp., 580 5th Ave., New York, N. Y. have just issued their new Bulletin No. 108 which describes their improved Type A and Type 14 Oil Burners.

Votator Method of Heat Transfer for Liquids and Viscous Materials

A new booklet describes a unique and highly efficient mechanism for heating or cooling of liquids and viscous materials, which also offers mixing, emulsifying or aerating simultaneous with heating or cooling. The unit is known as the "Votator." Outstanding features are: (1) Heats or cools *in seconds*, by a patented principle of passing a very thin film of product over a relatively large heat transfer surface. (2) Continuous rapid flow of product through unit. (3) Uniform temperature, accurately controlled. (4) A completely closed system. (5) Simplicity of design, which permits easy cleaning and enables unit to be connected into virtually any processing system. (6) More economy—due to increased speed and efficiency of heat transfer, use of less heat transfer medium, and facilities for simultaneous mixing. The "Votator" is available in standard sizes and designs. Helpful charts, diagrams, cross sections, and reference tables are included in the booklet. For a copy of the booklet on the "Votator Heat Transfer Unit," Address: The Girdler Corp., Louisville, Ky.

COMING MEETINGS AND EXPOSITIONS

For the next three months

APRIL

9–10	Midwest Power Conference, Palmer House, Chicago, Ill.
Week 19	The American Ceramic Society, 44th Annual Meeting, Netherland Plaza, Cincinnati, O.
19–23	American Society of Civil Engineers, Spring Meeting, Hotel Roanoke, Roanoke, Va.
20–24	American Foundrymen's Association, 46th Annual Convention and the Foundry and Allied Industries Show, Cleveland Public Auditorium, Cleveland, O.
20–24	American Chemical Society, Spring Meeting, Hotel Peabody, Memphis, Tenn.
27–28	Association of Iron and Steel Engineers, Spring Conference, Royal Connaught, Hamilton, Ont., Canada
27–May 1	American Mining Congress, Annual Coal Convention and Exposition, Music Hall, Cleveland, O.

MAY

7–9	Society for the Advancement of Management, Spring Conference, Cincinnati, Ohio
11–13	American Institute of Chemical Engineers, 34th Semi-Annual Meeting, Boston, Mass.
25–28	American Petroleum Institute—12th Mid-Year Meeting, Oklahoma-Biltmore Hotel, Oklahoma City, Okla.
28	American Iron and Steel Institute, General Meeting, New York
31–June 5	Society of Automotive Engineers, Semi-Annual Meeting, The Greenbrier, White Sulphur Springs, W. Va.

JUNE

1–4	Edison Electric Institute, Annual Convention, Atlantic City, N. J.
7–9	American Society of Refrigerating Engineers, Spring Meeting, Skytop Club, Skytop, Pa.
8–10	The American Society of Mechanical Engineers, Semi-Annual Meeting, Hotel Statler, Cleveland, O.
17–19	A.S.M.E. Oil and Gas Power Division, National Meeting, Peoria, Ill.
19–20	A.S.M.E. Applied Mechanics Division, National Meeting, Massachusetts Institute of Technology, Cambridge, Mass.
21–25	American Water Works Association, Conference on Wartime Problems of Water Supply, Exhibit of Water Works Equipment, Stevens Hotel, Chicago, Ill.
22–26	American Association for the Advancement of Science, Summer Meeting, Ann Arbor, Mich.
22–26	American Society for Testing Materials, 45th Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.
22–26	American Institute of Electrical Engineers, Summer Convention, Drake Hotel, Chicago, Ill.
24	American Society of Heating and Ventilating Engineers, Semi-Annual Meeting, Hotel St. Paul, St. Paul, Minn.
29–July 1	American Society of Agricultural Engineers, Annual Meeting, Hotel Schroeder, Milwaukee, Wisc.
29–July 2	Society for the Promotion of Engineering Education, 50th Annual Meeting, Hotel St. Paul, St. Paul, Minn.

For Calendar of Coming A.S.M.E. Meetings see page 320 in the editorial section

SERVING INDUSTRY
18 SINCE 37
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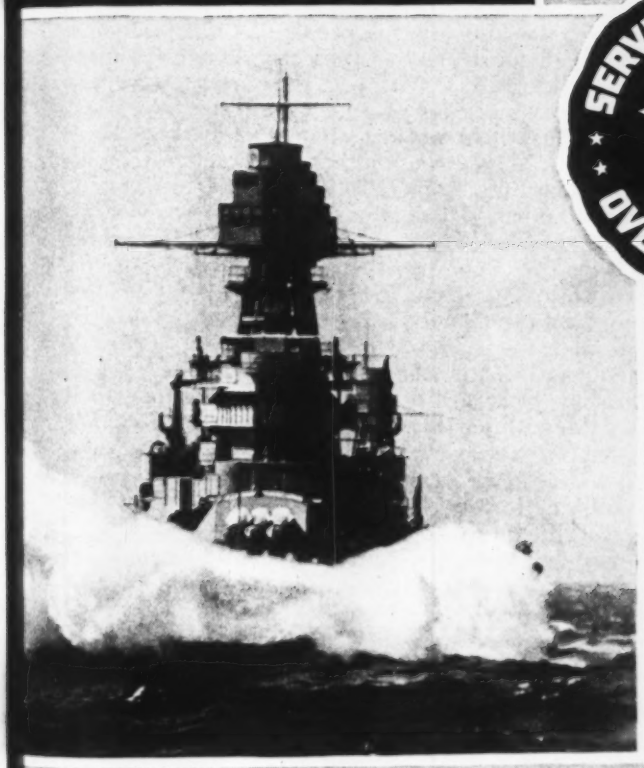
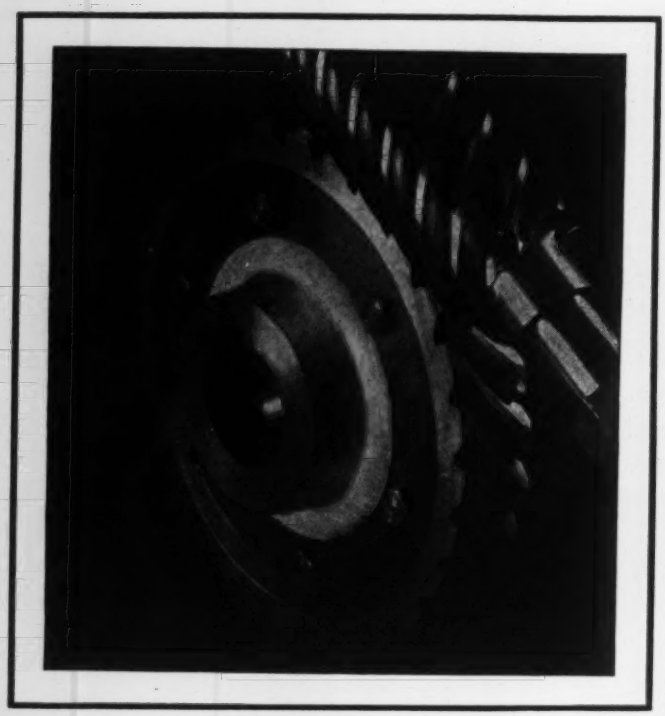


KROPP



"Have installed over 50 of your Reducers in 20 years

...will certainly buy more Clevelands as needed"

THIS large Eastern Company first bought 6 Cleveland Units in 1922 and has increased its purchases since then to a total of more than 50. This evidence of satisfaction with Clevelands is confirmed in a letter from one of its Engineering Executives:—

"Our Cleveland Worm Gear Drives have given an excellent account of themselves. Of the 50 or more we purchased, 13 are driven by 40 H. P. motors and have operated day and night.

"We certainly will buy more of your Drives if we install additional machines."

Install Clevelands on the equipment *you* build, and help insure trouble-free operation and maximum output—8 hours a day, or 24.

The Cleveland Worm & Gear Company, 3264 East 80th Street, Cleveland, Ohio.

Affiliate: The Farval Corporation, Cleveland, Manufacturers of Centralized Systems of Lubrication

In Canada: PEACOCK BROTHERS LIMITED

CLEVELAND WORM GEAR

Speed Reducers

The Standards COLUMN

News of Interest to Manufacturers

Standard Tolerances for Diameters of Shafts and Holes

An English version of ISA Bulletin 25 entitled "The ISA Tolerance System", published in January, 1941 by the International Federation of the National Standardizing Associations (ISA), is now available in pamphlet form. The English text is supplemented by seventeen tables all but two of which have been converted from the original metric units to inches.

The initiative to develop this standard system of tolerances for the diameters of shafts and holes was taken at a conference held in London in September, 1926 shortly after the ISA had been organized in New York. A subcommittee consisting of representatives of five ISA member-countries was appointed to prepare a proposal. This subcommittee held thirteen (13) meetings covering fifty-five (55) working days. Its periodic reports were discussed at three meetings of ISA Committee No. 3 on Limits and Fits held at Prague in October, 1928, in Copenhagen in May, 1941, and in Stockholm in September, 1934. The final report of the subcommittee was issued in December, 1935. During the five years, December 1935 to January 1941, this proposal was submitted for review to the twenty-two countries which hold membership in the ISA, including the United States, which is represented on the ISA through the American Standards Association.

In the meantime, the need for a revision of the American Tentative Standard for Tolerances, Allowances and Gages for Metal Fits, B4a-1925, had been realized. For this reason, Sectional Committee B4, originally organized in 1920, was reorganized in 1930. Under the chairmanship of John E. Lovely, it has had a number of subcommittees working on this problem.

The sectional committee held meetings in 1935 and 1938 in New York, and in 1939 in Philadelphia. At these meetings the proposals developed by the subcommittees and individuals were discussed at length. In most cases copies of the proposals were distributed in advance. Also, the efforts of ISA Committee No. 3 to develop an internationally acceptable system of fits was brought to the attention of Committee B4. While the proposed ISA system was originally set up in the metric system of measurement, some members of Sectional Committee B4 were of the opinion that, if the ISA System of Tolerances, as given in the final ISA report, Bulletin 25, was made available with English text and data given in inch units, this would be of value to the committee's work.

The American Society of Mechanical Engineers, sponsor for Project B4, was requested, accordingly, to arrange for the conversion of the numerical values of ISA Bulletin 25 and its publication as a pamphlet. Committee B4 offered to underwrite a part of the expense involved. For an announcement concerning the sale of this pamphlet see Page 38 of this issue.

For further information—Address

The American Society of Mechanical Engineers
29 West 39th St., New York, N. Y.

• Keep Informed . . .

Announcements in this section are supplied by current advertisers in MECHANICAL ENGINEERING and A.S.M.E. MECHANICAL CATALOG. This section is restricted to these advertisers.

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- *BUSINESS CHANGES*
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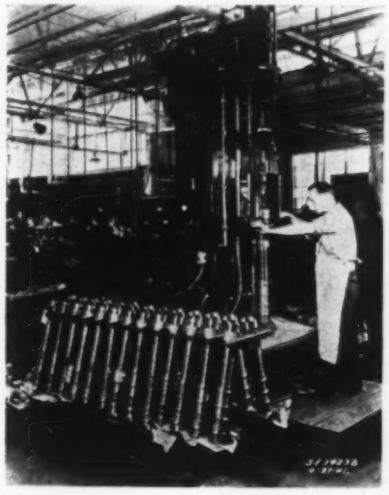
• NEW EQUIPMENT

Barnesdril Self-Oiling Hydraulic Honing Machine

Barnes Drill Co., 819–37 Chestnut St., Rockford, Ill., announces a new vertical honing machine known as No. 307 Barnesdril Self-Oiling, Hydraulic, Honing Machine. This machine is designed particularly to meet the need of our National Defense effort primarily in the aviation engine field but also has a great deal of other versatility.

Internal Honing—is the operation of generating final finished surfaces on the interior of cylinder bores, using expanding hones provided with several abrasive stones of suitable grit and grade. Honing is accomplished by simultaneous rotations and reciprocations of the hone within the bore with the hone abrasives under preloaded spring pressure or under hydraulically controlled actuation of hone pressure application. Honing corrects errors resulting from previous processing operations and generates final dimensional accuracies within extremely low tolerances. Any desired type of surface finish and any degree of mirror smoothness imposed may be accurately accomplished on this honer.



The No. 307 Self-Oiling Hydraulic Internal Honer successfully hones bores up to $6\frac{1}{2}$" inside diameter. For standard spindle travels of 25" to 45" see specifications. This machine of various height sand spindle strokes, when equipped with the proper honing tools, provides the high accuracy and fine finish which are exclusive characteristics of the honing process and have proved completely successful in the large number of commercial installations, and are an extremely profitable investment on all work within their capacity and field of application.

Separate motors are used for rotations and for reciprocations of the spindle. Single speed or six speeds available.

Push-button control station starts and stops both motors. The "inching" button intermittently starts the cycle which provides power for hydraulic reciprocations thus gradually lowering the hone into cylinder without rotation. Then the operator presses the "Start" button and the hone reciprocates and rotates in the bore until the "Stop" button is pressed or until the spindle is automatically stopped by our patented electric stroke timer for automatic or for hydraulic hones (if this equipment has been provided on special order).

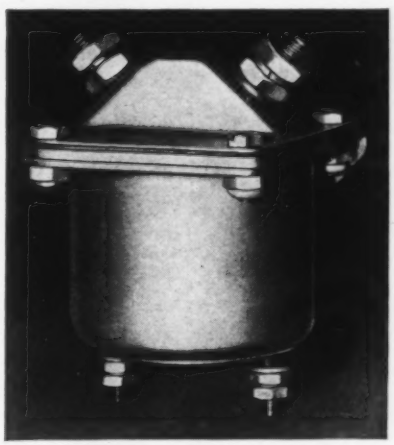
For maximum production at minimum cost on internal honing that is handled in large quantities, we build a complete line of vertical and horizontal self-oiling hydraulic honing machines in a wide variety of sizes, and we supply suitable equipment to order to handle any size or kind of work that can be honed. In such honing machines the rotation and reciprocation of the hone, or hones, may be started and stopped independently of each other. This, in combination with other exclusive features of these machines, provides maximum operating convenience, reduces to a minimum the time required for work-handling and starting the honing cycle, thus increasing efficiency and resulting in maximum production.

Machine is built in four standard spindle strokes, namely 25", 30", 35" and 45". The height over-all must increase accordingly, and the standard height for the 25" travel machine is 144". Net weight of this machine—8200 lb. Crated weight—9000 lb, boxed weight—10,200 lb.

Much valuable and practical information and data about internal honing is in our Bulletin No. 121-F entitled "The Honing Process," a copy of which will be sent to interested executives postpaid on request.

New General Electric Dynamotor Contactor

A new contactor specially designed to start and stop dynamotors used with aircraft equipment has been announced by the industrial control division of the General Electric Co. It is available for either 12- or 24-volt direct-current circuits, and conforms to the general requirements set up for aircraft control devices. The contactor is also applicable to tank installations.



The dynamotor contactor is approximately $2\frac{1}{2}$ in. wide and 4 in. high, weighs only 2.3 pounds, and can be mounted in any position. It is totally enclosed, with the contacts in the upper compartment and the coil and plunger in the lower compartment. Copper-lead-alloy contact tips are used to assure the best high-current inrush performance.

The contactor meets Signal Corps vibration requirements, being good for mechanical frequencies of 5 to 55 cycles per second at a maximum of $\frac{1}{32}$-inch amplitude ($\frac{1}{16}$-inch total travel) applied in any direction. The single-pole, normally open contacts are designed to stay open when the coil is not energized, and closed when the coil is energized even when the contactor is subjected to a linear acceleration of 10 times gravity (10G) applied in any direction, or to the vibration conditions outlined above.

All ferrous parts of the contactor are treated to resist corrosion. Nonferrous parts are likewise treated except where such treatment would interfere with operation. The contactor is suitable for use in ambient temperature ranging from 60 C to minus 40 C.

The contact rating is 50 amperes on an 8-hour basis. Inrush current rating is 500 amperes at 32 volts direct current. Coil wattage is 9.5.

Fewer Rejects at Pierce-Roberts With High Temperature Condensate Return

While applications of the Cochrane-Becker high-pressure condensate return system produce impressive savings in any processing operations where quick heating is necessary, the savings at the Pierce-Roberts Rubber Co., Trenton, N. J., are particularly tangible.

Here, in the manufacture of gaskets, washers, and miscellaneous mechanical rubber goods, 32 vulcanizing presses are in constant operation. Steam is supplied the presses at 120 lb. to 125 lb. per square inch. The condensate return system evacuates the molding presses at 85 lb. per square inch. Previously, the returning condensate flashed in an open hot-well was in a large measure wasted, and the heat from the 5 lb. exhaust of a compressor engine was completely wasted to atmosphere. Now the high-pressure condensate is returned direct to the boiler at a temperature approximating 325 degrees and the 5 lb. compressor exhaust is completely utilized in heating makeup.

The net results of the installation include fewer rejects with increased production and

Continued on Page 23

MOLYBDENUM ENLISTS FOR THE DURATION

The enormous increase in requirements of molybdenum has necessitated the War Production Board Order M-110, placing molybdenum consumption under allocation control...Our metallurgical research staff is fully engaged in war work. At our mine, mill and converting plant, every effort is being made towards maximum production.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.
MOLYBDIC OXIDE—BRIQUETTED OR CANNED • FERROMOLYBDENUM • CALCIUM MOLYBDATE

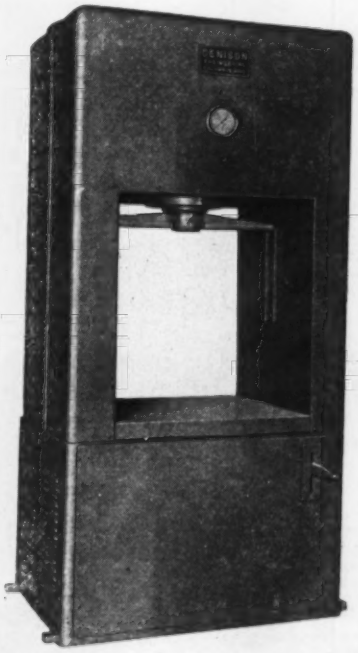
Climax Molybdenum Company
500 Fifth Ave. • New York City

MOLY

more accurate timing of the "cure" period plus an estimated 28% fuel savings, the latter due in part to the better heat balance made possible by use of the previously-wasted compressor exhaust.

Versatile Hydraulic Press

A new, highly versatile oil hydraulic press, known as Model DLOS2 HydrOILic Press, offered in capacities of 50 ton and up, has just been announced by The Denison Engineering Co., 19 West Chestnut St., Columbus, Ohio. It supplements the applications and wide range of tonnage capacities previously offered by this company's line of small capacity presses. It is adapted to a wide range of straightening, assembling and pressing operations in either small-lot or production work.



This press is of rugged construction, self-contained, streamlined, and free of projections, more modern in appearance and safer to operate. The safety factor has also been considered in the location of controls, and the press ram is threaded internally for attaching, assembling, bending or straightening tools.

General arrangement of the press is as follows: the ram and cylinder head assembly is located in the top part of the box frame, the directional control valve and its operating mechanism, the motor, pumps, tonnage controls, and oil reservoir are located in the base of the press.

The DLOS2 press is furnished with hand-lever or electrical controls, located in the base of the press, and the control is arranged so that tonnage applied to the work is controlled, within reasonable limits, by the operator in accordance with the requirements of the operation.

To operate, the control lever is pushed down. This causes the ram to move downward at rapid-traverse speed until it contacts the work, exerting a minimum of tonnage. To increase the tonnage applied to the work, the control lever is moved further downward by the operator. When the control lever is released, the ram moves upward until the upper "stroke stop" on the shipper rod is reached, moving the control valve to the neutral position. The pump and motor then run idle, consuming a minimum of HP, and the ram is held in place HydrOILically.

For electrical control, the press is equipped with two operating push-buttons, requiring hand tie-up, as the press will not operate if only one button is pushed. The press will continue to exert pressure until the push-buttons are released when the ram will return to its normal position.

For more information about any Denison equipment and how HydrOILics can help you, write directly to the factory.

Cochrane Marine Deaerators

The Hawaiian Packer and the Hawaiian Planter, cargo ships built by Newport News Shipbuilding and Dry Dock Co. for the Matson Navigation Co. are equipped with Cochrane marine deaerators of atomizing design.

By the use of the internal preheater and atomizer, the Cochrane marine deaerator greatly reduced the weight and space required for a given capacity. Improved efficiency in the use of fuel and heat is attained by heating the boiler feed to the exact temperature of the saturated steam in contact with it.

Quick-Hardening Iron Cement for Patching Concrete Floors

A new Smooth-On product, based on the 47 years of experience of the manufacturer in making iron repair cements, has been developed for quick patching of cracks, ruts, and shallow holes in concrete floors. This product, known as Smooth-On No. 7B Quick Patch Cement, hardens quickly and adheres firmly to the surfaces with which it is in contact.

Like other Smooth-On Cements, the new composition has an iron base, so that it is extremely wear-resistant as well as dust-proof, oil-proof and water-proof. Patches of Smooth-On No. 7B harden over-night, permitting full traffic the following morning, and become stronger with age. Complete information and prices can be obtained by addressing Smooth-On Mfg. Co., Dept. 316, 570 Communipaw Ave., Jersey City, N. J.

New Amsco Welding Rod, "V-Mang," Developed to Conserve Nickel

To conserve nickel for our war effort, so that it can be used where it will do the most good, the American Manganese Steel Division of The American Brake Shoe & Foundry Co., Chicago Heights, Ill., now has available a new manganese steel welding rod known as V-Mang.

An alloy steel containing 12 to 14% manganese, molybdenum, and other elements, this electrode has resulted from research started by Amsco's metallurgists several years back looking for a better welding rod. It will replace Amsco Nickel-Manganese Steel electrodes, except in a few exceptional cases, thus conserving this critical metal without hampering reclamation of manganese steel and other ferrous equipment parts, so necessary at this time. While molybdenum is costlier than nickel, V-Mang Rod will be priced the same as Amsco Nickel-Manganese Steel Rod.

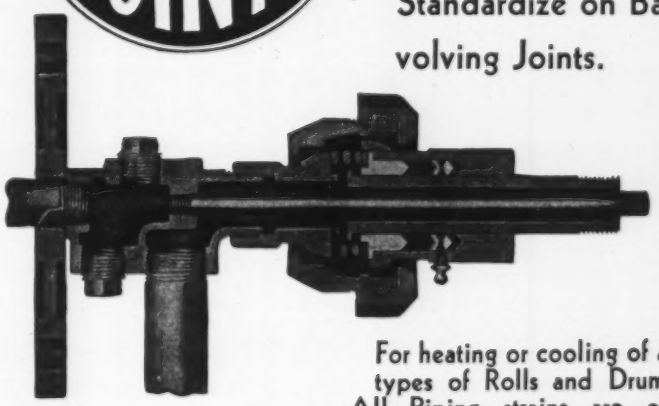
Thorough tests under field conditions have shown that the new rod can be applied as readily as Amsco Nickel-Manganese Steel Rod and that it has ductility and tensile strength equal to or better than nickel-manganese steel rod as applied. V-Mang can be used to repair fractures in manganese steel parts, as well as for build-up work, de-

Continued on Page 24

BARCO REVOLVING JOINTS

Eliminate costly shut downs and packing maintenance due to packing troubles.

Standardize on Barco Revolving Joints.



Note Flexibility of Movement

For heating or cooling of all types of Rolls and Drums. All Piping strains are eliminated in Barco Revolving Joints.

BARCO MANUFACTURING CO.
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1807 Winnemac Ave., CHICAGO, ILL.
In Canada—The Holden Co., Ltd.

Write for Catalog No. 292

How OHMITE can save you man hours of Engineering and Production Time

WIDEST RANGE OF STOCK UNITS. Ohmite produces the widest range of types and sizes in Power Rheostats, Resistors and Tap Switches. This facilitates selection of the right units for most applications. It often avoids the necessity of designing special units. There are over one thousand stock items alone available for quick needs.

ENGINEERING SPECIAL UNITS. Because of long, specialized experience in supplying units for electronic, scientific and industrial applications—and because of familiarity with Government specifications—Ohmite Engineers can take a "load" off your mind and your time. Let them work with you to expedite the engineering of special units for you.

DELIVERIES. Increased plant size and productive capacity are speeding up the production and delivery of Ohmite Products for essential needs. Everything possible is being done to help win the race against time.

Send for Catalog and Manual No. 40

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BE RIGHT WITH ★ OHMITE Rheostats Resistors Tap Switches

OHMITE MFG. CO.
4808 Flournoy St.
Chicago, U. S. A.

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positing a uniform bead similar to that afforded by nickel-manganese electrodes.

V-Mang does not replace Amsco Mo-Mang; a high manganese, high carbon, molybdenum rod that is not as ductile as the new rod and is recommended for build-up work only. V-Mang is available bare and coated in 1/8", 5/32", 3/16" and 1/4" diameters; in 18" lengths. Standard containers, waterproof-paper lined wooden boxes, consist of 50 lbs. of rod.

Further information on V-Mang is available from the manufacturer on request.

Try Cocks

Leakless, and sure to shut off tight, Discs can be replaced under full boiler pressure. Different designs for different pressures, chain pull and weighted types. Monel-metal and bronze combination for pressures up to 450 pounds. Forged steel and stainless steel construction for higher pressures up to 1500 pounds. Send for illustrated Catalog A 45 to Ernst Water Column & Gage Company, Livingston, N. J.

Crater Eliminator

A "Crater-Eliminator" which assures a uniform, neat finish to the end of an arc welding bead without decreasing strength or ductility has been introduced by the Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Especially adapted for use with the popular Allis-Chalmers Weld-O-Tron arc welder, the new "Crater-Eliminator" is, however, a separate unit, consisting of current adjusting rheostat and motor.

To eliminate the rough crater-like pit that frequently forms when the arc is broken, the current is slowly dropped to zero at the end of a weld. This action is accomplished with a shading pole type reversible motor which operates a rheostat, varying the welding current. A push button on the electrode holder of the welding unit is pressed at the top of the weld and again at the end of the weld, automatically changing the current from maximum to normal to low without disturbing the arc. Since the rheostat automatically returns to the "hot-start" setting, no time is lost in starting the next weld.

For the welding of thin gauge metals at extremely low currents, the "Crater-Eliminator" adds greatly to the appearance and strength of the weld. Current as low as 5 amperes are now possible with the Allis-Chalmers Weld-O-Tron arc welder.

Vital Parts For Lockheed Interceptors Heat-treated For Elasticity and Toughness

Tubular parts for the speedy Lockheed Interceptor planes now being turned out for use both by this country and Great Britain are produced in record time at the Menasco Manufacturing Co. Since these vital parts must be both elastic and tough to withstand the strain of lightning-like Interceptor movements, careful heat-treating is essential.

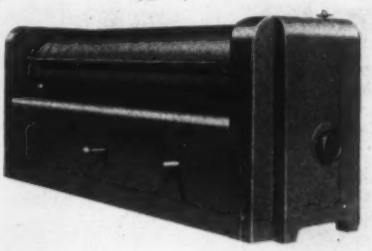
To accomplish this job in step with today's high-geared production, Menasco has installed four General Electric cylindrical electric furnaces for hardening and drawing, and a water-cooled oil quench. Two G-E atmosphere gas converters maintain an inert atmosphere in the furnaces, and assure that the analysis of gas in the furnaces is constant regardless of changes in the rate of flow.

Heretofore, one of the greatest difficulties in hardening and drawing tubular parts has been excessive cooling encountered in transferring the parts from the furnace to the quench tank. This difficulty has been overcome at Menasco by installing two quenching hoods on the G-E hardening furnaces to protect the parts as they are transferred.

This transfer of parts is accomplished quite simply. After the charge is brought up to the proper temperature in the hardening furnace, a high-speed hoist, equipped with a transfer hood, is brought over the furnace and the charge quickly pulled into the tranfer hood. The hood is then positioned over the oil quench tank and the charge quickly dropped into the oil. This transfer hood minimizes cooling, warpage, and scaling of the thin-wall tubular parts during transfer from the furnace to the oil quench tank.

New Pease Dark Room Printer

A Dark Room Printer of special design and compact assembly is announced by the C. F. Pease Co., 2623 West Irving Park Road, Chicago, Ill. This new printer is inexpensive and small as to size. It is streamlined and particularly desirable for table use, yet adequate in all respects for all dark room printing requirements.



The seven essentials of successful dark room printing were kept vividly in mind by the engineering staff in developing this new printer which is known as the Model "D-3". These five points are (1) positive contact; (2) accurate light control; (3) variable speed control; (4) adequate speed for all dark room printing requirements; (5) compactness and durability; (6) low initial cost; (7) low operating cost.

Model "D-3" utilizes Sliding Contact, a feature which closely approximates vacuum contact and is found only in Pease printers. The contact glass is approximately 9 inches deep, lies parallel to the width of the machine, and is slightly curved, just enough to insure perfect contact. It is made of special, polished Trans-Peco glass which passes a high percentage of Actinic printing rays.

The contact band, of the endless chain type, is made of black, specially woven, two ply, seamless fabric. The use of a black band prevents light leakage in the dark room.

The light source in Model "D-3" consists of two 40-watt white fluorescent tubes. These are standard tubes, easily obtainable, long lived, low in cost and economical in current consumption. Total current consumption is approximately 5 amperes. Practically no heat is developed by the tubes and, therefore, it is not necessary to provide artificial cooling.

The amount of printing light desired is controlled by a "clam shell" type shutter. This shutter, when closed, completely surrounds the tubes. It is composed of two semi-circular stainless steel shutters which swing from the same hinge. The adjustment is simple and is accomplished by means of a lever that is held by a quick release pin which allows the shutters to be completely closed or opened to any width up to approximately three inches. For extremely accurate ad-

justments Model "D-3" is equipped with a fine hair-line vernier type regulator screw.

Model "D-3" Dark Room Printer is driven by a one-quarter horse power variable speed motor through a controller mounted at the right side of the printer. A two-speed gear shift provides a speed range of approximately two inches to three feet per minute in low gear, and from ten inches to five and one-half feet per minute in high gear. All variable speeds in between these two ranges are accomplished by means of the controller.

The combination of this wide range of controlled variable speeds plus the wide range of accurate shutter opening adjustments makes it possible to obtain an almost unlimited variety of exposures, suitable to all dark room printing conditions.

The quick release lever located in the center of the front panel is easily operated by hand. It releases the belt tension quickly and positively, a valuable feature when the operator finds it necessary to quickly insert a filter into the printer. Pressure exerted on the release lever will iron out exceptionally heavy and wrinkled tracings.

The Model "D-3" Printer is completely enclosed when in the operating or printing position. Thus, it produces no light leakage in the dark room.

All metal construction is used throughout the machine, the frame is electrically arc welded into one rigid piece. The exterior sheet metal is heavy gauge, attractively finished in popular Pease gray enamel.

The overall height of Pease Model "D-3" is 22 inches, overall width 60 inches, and overall depth 18 inches. It requires a table space of 60 x 18 inches. Net weight is approximately 240 pounds.

Model "D-3" operates on 110 volts alternating current only. If direct current is used, it is necessary to obtain a rotary converter because fluorescent tubes cannot be operated on direct current. However, a converter of this type is very inexpensive.

The test under working conditions have proved this printer highly successful Dark Room Equipment.

• BUSINESS CHANGES

Tube-Turns Opens Houston Office

On April 1st Tube-Turns, Louisville, Kentucky, manufacturers of welding fittings and forged steel flanges, opened a branch office in Houston, Texas. This office, located in Room No. 1707, Commerce Building, will be managed by W. B. Whenthoff, formerly in charge of the Tube-Turns office in Tulsa, Oklahoma.

New Branch Office for Goulds Pumps

To facilitate the handling of Government business, Goulds Pumps, Inc., whose main office and factory is in Seneca Falls, N. Y., has established a Washington, D. C. Office with J. B. Darden in charge. This new office is located at 505 Colorado Bldg., 14th and G Sts., Washington, D. C. Telephone: Executive 4593.

Additions to Bailey Field Engineering Staff

Increased demands for metering and control equipment to speed production in war industries has necessitated an enlargement of Bailey Meter Company's Field Engineering Staff. The following Engineers have recently been assigned to field duty: J. T. Elder and J. E. Wood to Atlanta, J. E. Luppold to Seattle, E. P. Nye to Buffalo, R. B. Pogue to Milwaukee, W. D. Hilborn to Houston, J. J. Haslam to Kansas City, J. J. Wilber to Cleveland, C. E. Hicks to New York, J. R. Powell to Pittsburgh, S. G. Dukelow to Denver, R. V. Johnson to Chicago, W. D. Robinson to Boston, and C. C. Holtzman to Philadelphia.

Kersh Appointed Manager of Westinghouse Houston Office

Robinson S. Kersh, an industrial sales engineer, has been appointed manager of the Houston, Texas, office of the Westinghouse Electric & Manufacturing Co., according to C. E. Allen, southwestern district manager.

Joining the Westinghouse Graduate Student Course in July, 1929, Mr. Kersh was given experience in various headquarters sales sections before being transferred in 1931 to the Atlanta, Ga., sales office. Later the same year he was assigned to Birmingham, Ala., and remained at that office until 1938, when he moved to the machinery electrification and aviation section at East Pittsburgh. He served in this section until his present appointment.

Born in Pelahatchie, Miss., in 1908, Mr. Kersh attended high school at Jackson, Miss., and was graduated from Mississippi State College in 1929 with a degree in electrical

Continued on Page 26

Veterans of the Airlines...

Elastic Stop Nuts hold the wings to the fuselage, on all Douglas DC Series Transport Airplanes. This is but one of the many Elastic Stop Nut applications on these famous ships.

DOUGLAS DC TRANSPORTS and ELASTIC STOP NUTS

Since 1936, more than 500 Douglas DC Series Transport Airplanes . . . in the air 2,400,000 hours . . . have flown over 350,000,000 miles. The meaning of this remarkable record, in terms of safe and rapid transportation, is well known.

One important reason for this performance, and for the fact that these ships are still in top flying condition, is that they are fastened throughout with vibration-proof Elastic Stop Nuts . . . more than 30,000 on each ship.

These self-locking self-gripping nuts are used today, at vital structural and secondary connections, on every military and transport airplane built in the Western Hemisphere . . . and on innumerable other classes of mechanical and electrical equipment.

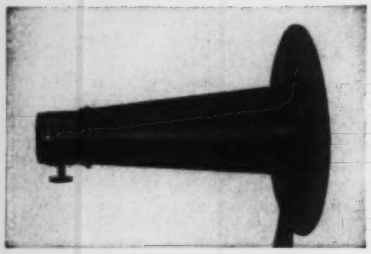
TEST ELASTIC STOP NUTS on your products and equipment. Sample nuts will be furnished without cost or obligation.

» Catalog on request

ELASTIC STOP NUT CORPORATION
2375 VAUXHALL ROAD • UNION, NEW JERSEY

Elastic Stop SELF-LOCKING NUTS

The LENS *that assures* PRECISION

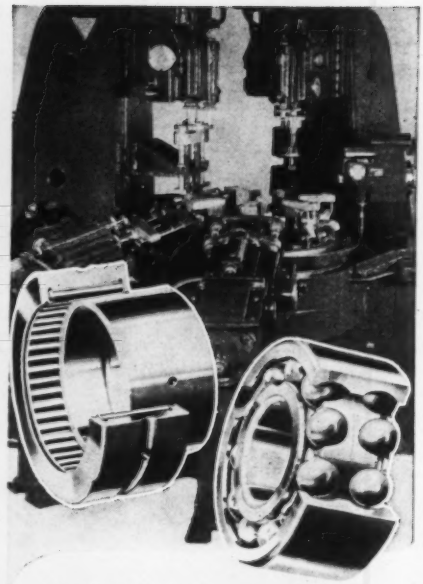


For either qualitative or quantitative photo-elastic analysis, perfection in the projection lens system is of major importance.

In our new model polariscopes of 4¼" & 6¼" clear aperture, the parallel beam is collected by a rear element and condensed through a three component lens of the Cooke system. In the new larger units (8¼" and 10" aperture) a four component lens of the Omnar system is used. In both cases, *the image is sharp throughout the field, free of aberration, astigmatism, and distortion.*

Literature of new model polariscope now available.

POLARIZING INSTRUMENT CO.
630 Fifth Ave., New York, N. Y.



McGILL Bearings are precision built, adaptable to all types of mechanical equipment. . . This multiple-operation machine is completely equipped with McGILL Bearings, including "Solid-end" *MULTIROL* and Maximum Capacity Bearings.

Bearing Division

McGILL

MANUFACTURING CO.
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WHEN HEAVY LOADS CAUSE Machine Tool Chatter or Hot Bearings and Gears

USE "STURACO" ★★★★ EXTREME PRESSURE ("EP")

MACHINERY OILS & GREASES

• Here is the answer to many of your lubrication problems caused by today's production demand of heavy loads, high speeds, and continuous operation of machinery and machine tools. "Sturaco" EP Oils and Greases, without any change in your accustomed viscosity or consistency, offer a minimum of 300% *increased load carrying capacity* with notable low torque.

Lubrication of ways — spindle bearings — gear heads — elevating screws — speed reducers — are typical examples where "Sturaco" application has solved tough lubrication problems. If you need help, write or phone today.

• • •

SEND FOR the new "Sturaco" booklet outlining laboratory research behind this genuine development, describing typical applications and listing various grades.

For All Cutting Fluid Problems
D. A. STUART OIL CO.
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engineering. At college he was president of the student chapter, American Institute of Electrical Engineering, and a member of Tau Beta Pi, honorary engineering fraternity.

Edge Moor Appointment

Edge Moor Iron Works, Inc., Edge Moor, Delaware, announces the appointment of F. L. Craddock as Sales Manager of Mixing and Process Equipment Division, with headquarters at Edge Moor, Delaware. Mr. Craddock was formerly President of the Mixing Equipment Co.

Geiser District Manager Tube-Turns Philadelphia Office

Tube-Turns, of Louisville, Kentucky, manufacturers of welding fittings and forged steel flanges, announces the appointment of W. E. (Bill) Geiser as District Manager of their Philadelphia Office in the Broad Street Station Building. Mr. Geiser has been connected with Tube-Turns, since 1929.

Kent Joins the Navy

Manning, Maxwell & Moore, Inc., of Bridgeport, Conn., announce that their Dallas, Texas representative, Mr. Alfred Kent is now Ensign Alfred Kent, having joined the U. S. Navy and has been on active duty at the Charleston, South Carolina Navy Yard since March 16.

Their representative, Fred Crabbe, who formerly covered the Corpus Christi territory, has been transferred to Dallas and for the duration will cover Ensign Kent's former Dallas territory.

Allegheny Ludlum's Pittsburgh District Sales Manager to the Navy

Leave of absence to accept a Lieutenant's commission in the United States Navy has been granted to R. S. Ahlbrandt, Pittsburgh District Sales Manager for Allegheny Ludlum Steel Corp., Pittsburgh, Pa., according to an announcement by R. M. Allen, General Sales Manager of the Company.

Mr. Ahlbrandt was a graduate of Annapolis, and a member of the Naval Reserve. He was the Pittsburgh District Sales Manager for Ludlum Steel Company before its merger with Allegheny, and became Assistant Sales Manager in the district when the two companies joined, later moving up to the managership.

This background of experience in the steel business, coupled with Mr. Ahlbrandt's earlier Naval training, were the chief factors in his call by the Navy to a post in Washington, which he has already left Pittsburgh to assume.

• LATEST CATALOGS

Motors and Controls Selected with "Slide Rule"

A pocket size "slide rule" selector for electricians, plant maintenance men and others interested in the selection of electric drive equipment has recently been announced by Westinghouse Electric & Manufacturing Co.

To guide in the selection of the proper type of motor for each of 44 industrial applications, a convenient table lists the various uses and indicates which of the four principle types of a-c motor should be selected. The specifications, performance ratings and control classes for the required type is readily determined by making the corresponding setting on the slide.

Information is obtained from the selector by setting the cardboard slide for the proper motor type and then reading its specifica-

tions through the window in the acetate envelope. Pertinent facts such as horsepower ratings, speeds, voltages, frequencies, and starting and pullout torques are thus secured. The reverse side of the selector shows which of the various magnetic and manual controls are available for each type of motor and lists the proper control number.

This motor and control Electric Drive Selector, SA-714, can be obtained from Westinghouse district offices and distributors.

Welded Construction

Graver Tank & Mfg. Co., 4908–27 Tod Ave., East Chicago, Ind., has just issued a new Bulletin SP-102, covering Graver Welded Construction in the manufacture of machinery bases and other equipment. Many products are made by Graver faster—better—and more economically. By this Graver method there is no pattern expense—deadweight is eliminated—close tolerances—greater rigidity—final manufacturing time is cut—low factor of depreciation—and greater all-around economy.

New Leaflet Describes Prestite

Prestite, a porcelain for molding to intricate shapes of which electrical and mechanical properties must be high, is described in a new four-page leaflet announced by the Westinghouse Electric & Manufacturing Co.

Twenty-five questions and answers cover the important points that might be raised by the prospective user of this material. Some of these are strength, weight, expansion, maximum sizes, and dielectric strength.

Prestite is one of the few materials for which no priority is necessary. The steel used in the original molding die does necessitate a priority rating.

A copy of leaflet B-3100 may be secured from department 7-N-20, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

Link-Belt Truck Cranes

Coming off the press of Link-Belt Speeder Corp., 301 W. Pershing Road, Chicago, is a new 6-page illustrated Book No. 1928 on their Model HC-70 truck-mounted crane—a highly mobile and versatile machine which it is pointed out should be a part of the equipment of every contractor.

It can be used with hook block, clamshell bucket, or a dragline bucket, and is recommended for wrecking operations, steel erection, excavating, material handling, road maintenance, etc.

Brief specifications, clearance dimensions and lifting capacities are given, including capacities with 30, 40 or 50 ft. long boom, with or without the use of outriggers.

The boom of the machine can quickly be folded together and laid down alongside of truck's half-width cab, when traveling to, from or between jobs.

New book indicates that the machine can go almost anywhere at any time under its own power, derived from a 60-h.p. industrial type gasoline or Diesel engine.

A copy of Folder 1928 will be forwarded to any interested reader on request.

Engineering Data Book for Pumps

Complete engineering data on Allis-Chalmers SSUnit pumps and the Electrifugal has just been issued in a 36-page compilation of the Allis-Chalmers Manufacturing Co. at Milwaukee, Wis.

Head capacity tables and dimension charts make it easy to select proper pumps for individual applications. Performance data and engineering recommendations, also part of the bulletin, are additional aids in the selection of units for pumping more gallons at less cost. Cross sections and construction details help to illustrate this complete pump line.

The compact, efficient motor-pump units and base-mounted units described are built in a wide range of sizes for capacities from 10 to 2750 gpm and for heads up to 575 feet. They have an unusually wide application throughout industry, many of these varied applications being illustrated in this bulletin, B6018-B.

New Ampco Bulletins

Ampco Metal, Inc., Milwaukee, are distributing two new bulletins covering "Ampco Metal in Aircraft" and "Ampco Metal in Acid Resistant Service." These are letterhead size, six pages, and well illustrated.

"Ampco Metal in Aircraft" discusses the growing use of aluminum bronze by the aviation industry, contains a diagram of a typical plane indicating the numerous parts made of Ampco Metal, and gives a comprehensive table of aircraft specifications met by Ampco-made bronzes.

"Ampco Metal in Acid Resistant Service" describes the ability of Ampco Metal to resist acid and corrosion, and shows the importance of Ampco-made bronzes in this field. The bulletin is well-illustrated with views of parts used in acid-resistant service.

Copies of the new bulletins will be sent on request to those interested in these services.

Foxboro Potentiometer Indicators

A new bulletin has just been issued, presenting the complete line of Foxboro Potentiometer Temperature Indicators and Indicating Resistance Thermometers. The instruments illustrated and described include single-point and multiple-point models, models equipped with selective key-switches for as many as 82 contact points, as well as the popular portable models. Single range and double range dials are shown in full-size reproductions and a complete list of standard ranges is given. Constructional features of the instruments are shown and described, many of these features being exclusive in Foxboro design. Copies of the Bulletin, No. A-305, will be sent on request. Address The Foxboro Co., Foxboro, Mass.

Combined Gas and Oil Burners

Peabody Engineering Corp., 580 Fifth Avenue, New York, N. Y., announce new folder, No. 203, just off the press, describes the improved Peabody Combined Gas and Oil Burner. A copy will be sent on request to anyone interested.

Insulating Fire Brick

Laclede-Christy Clay Products Co., St. Louis, Mo., announces a new circular on their JJ-815 Insulating Fire Brick which advances for the first time, it is believed, the theory of double porosity in the manufacture of insulating brick. The principle seems to be entirely sound, and the chart on page four of the circular supplies sufficient technical data to substantiate all claims made for the product.

The whole idea back of this new brick is to supply a stronger, denser brick, that will hold against strong mortar and will not crack under load, without impairing its insulating qualities. This has been accomplished in the JJ-815 insulating fire brick which, despite these advantages, can be sold for somewhat less than the soft insulating brick.

Continued on page 28

⬇ ⬇ ⬇ Here's the way Lube Oil Looks BEFORE and AFTER *Passing through a* NUGENT FILTER!

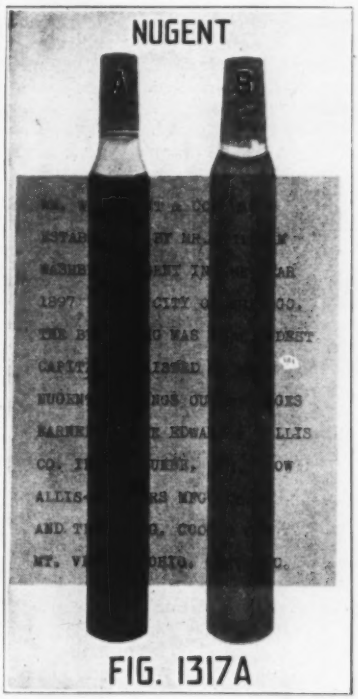

FIG. 1317A

(Taken from an actual, unretouched photograph.)

NUGENT TRADE MARK

BEFORE: **Shown at the left is a sample of dirty crankcase oil taken from a 300 H.P. gas engine *before* installing Nugent Filter.**

AFTER: **At the right is a sample of oil from the same engine *after* installing Nugent Filter, and operating 1,344 hours before cleaning filter.**

—This is the kind of protection against dirt troubles you get for *any* kind of oil when you use Nugent Pressure Filters. Write for complete information and literature on Nugent Filters—Sight Feed Bearing Oilers—Telescopic Crank Pin, Crosshead Pin and Eccentric Oilers—and other lubrication specialties.

WM. W. NUGENT & CO., INC., Established 1897

407 N. Hermitage Ave., Chicago, Illinois

The De Laval-IMO OIL PUMP

runs at gasoline engine, as well as at motor or turbine, speeds, making a clean, compact and neat unit in any combination.

The engine-driven unit shown serves as standby for a similar motor-driven IMO, insuring continuous supply of oil to burners in case of interruption to electric power.

Ask for Publication I-92.

IMO PUMP DIVISION
of the De Laval Steam Turbine Company
Trenton, New Jersey

PROFESSIONAL SERVICE

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140 S. Dearborn St., Chicago, Ill.

RATE Announcements under this heading in MECHANICAL ENGINEERING are inserted at the flat rate of $1.25 a line per issue, $1.00 a line to A.S.M.E. members, minimum charge, three line basis. Uniform style set-up. Copy must be in hand not later than the 10th of the month preceding date of publication.

• Keep Informed . . .

How to Run a Lathe

To further increase the effectiveness of their lathe operators' handbook for defense training purposes, the South Bend Lathe Works has just issued the 41st edition of this popular book, "How To Run A Lathe." A number of changes in text material and illustrations have been made since the previous edition was printed in 1941.

This book contains the latest information on the operation and care of metal working lathes. Covers such subjects as the operation of the lathe units, grinding cutter bits, making accurate measurements, plain turning, chuck work, taper turning, boring, drilling, reaming, tapping, cutting screw threads, reference tables, etc. Written clearly and concisely, it is widely used as a shop text in schools and apprentice training courses. This edition contains 128 pages—$5^1/_8'' \times 8''$, and over 365 illustrations. Copies are available for 25¢ postpaid. Write to South Bend Lathe Works, Department 6M, South Bend, Indiana.

Steam Hook-Ups

Sarco Co., 475 Fifth Ave., New York, N. Y. recently issued a new, greatly enlarged edition of their book of engineering data on selecting, sizing and installing Steam Traps, Temperature Regulators, Water Mixing Valves, and Heating System Specialties. Included in its 42 pages of data are 75 hook-up sketches showing correct steam piping for all types of industrial and heating equipment.

I-R Two Stage Centrifugal Pumps

The features of Class GT Two-Stage Centrifugal Pumps are well illustrated in a new 12-page, 2-color bulletin announced by Ingersoll-Rand Co. This bulletin contains 28 photographs and cross-sectional views, extensive performance tables, and a comprehensive tabulation showing friction of water in various sizes of pipe. In addition, the text matter describes many structural details of the pumps, and cites applications which have been found for the units in chemical plants, paper mills, breweries, refineries, canneries, packing plants, mines, and other industrial organizations.

Free copies of the booklet, Form 7167, may be obtained from Ingersoll-Rand Co., 11 Broadway, New York, N. Y., or any of its branch offices.

How to Safely Stretch Steaming Capacity

As an aid to Power Engineers who are faced with the necessity of meeting sharply increased steam demands and who will be obliged to operate their boiler plants on a 168-hour week schedule, Bailey Meter Co., 1026 Ivanhoe Road, Cleveland, Ohio, has prepared a 20-page bulletin, No. 16, entitled "How to Safely Stretch Steaming Capacity."

Numerous fundamental suggestions are made under the general headings of: (1) Check Condition of Boiler and Furnace, (2) Check Operating Procedure, (3) Check Possibilities for Modernization, and (4) Base Daily Operation on Accurate Measurements and Records.

Many of the suggestions made can be carried out without the use of elaborate metering or control equipment. This bulletin, which is really a check list of procedure for boiler room improvement, also explains how the proper use of metering and control equipment stretches steaming capacity, avoids frequent shut-downs for maintenance, insures safety of men and equipment, furnishes data for comparison of fuels, reduces fuel consumption, and maintains efficiency while new operating crews are being trained.

I-R Detachable Jackbits

The advantages of detachable Jackbits are described in a 2-color, 24-page bulletin announced by Ingersoll-Rand Co. This new bulletin, which is titled "How Jackbits Reduce Rock Drilling Costs," contains more than fifty illustrations, a table showing the types of Jackbits recommended for different kinds of work, and various cost data. It shows how, on numerous hard-rock jobs, the detachable Jackbits and I-R reconditioning equipment have raised drilling speed while lowering both drilling and steel-handling expense.

Free copies of this booklet, Form 2780, may be obtained from Ingersoll-Rand Co., 11 Broadway, New York, N. Y., or any of its branch offices.

COMING MEETINGS AND EXPOSITIONS

For the next three months

MAY

7–9	Society for the Advancement of Management, Spring Conference, Cincinnati, Ohio
11–12	The Association of Iron and Steel Engineers, Spring Conference, Hotel Royal Connaught, Hamilton, Ont., Canada
11–13	American Institute of Chemical Engineers, 34th Semi-Annual Meeting, Boston, Mass.
25–28	American Petroleum Institute—12th Mid-Year Meeting, Oklahoma-Biltmore Hotel, Oklahoma City, Okla.
26	Society of Naval Architects and Marine Engineers, Spring Meeting Hotel William Penn, Pittsburgh, Pa.
28	American Iron and Steel Institute, General Meeting, New York
31–June 5	Society of Automotive Engineers, Semi-Annual Meeting, The Greenbrier, White Sulphur Springs, W. Va.

JUNE

1–4	Edison Electric Institute, Annual Convention, Atlantic City, N. J.
7–9	American Society of Refrigerating Engineers, Spring Meeting, Skytop Club, Skytop, Pa.
8–10	The American Society of Mechanical Engineers, Semi-Annual Meeting, Hotel Statler, Cleveland, O.
11–12	National District Heating Association, 33rd Annual Meeting, The Dayton Biltmore, Dayton, Ohio
17–19	A.S.M.E. Oil and Gas Power Division, National Meeting, Peoria, Ill.
19–20	A.S.M.E. Applied Mechanics Division, National Meeting, Massachusetts Institute of Technology, Cambridge, Mass.
21–25	American Water Works Association, Conference on Wartime Problems of Water Supply, Exhibit of Water Works Equipment, Stevens Hotel, Chicago, Ill.
22–26	American Association for the Advancement of Science, Summer Meeting, Ann Arbor, Mich.
22–26	American Society for Testing Materials, 45th Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.
22–26	American Institute of Electrical Engineers, Summer Convention, Drake Hotel, Chicago, Ill.
24	American Society of Heating and Ventilating Engineers, Semi-Annual Meeting, Hotel St. Paul, St. Paul, Minn.
27–29	Society for the Promotion of Engineering Education, 50th Annual Meeting, Columbia University, New York, N. Y.
29–July 1	American Society of Agricultural Engineers, Annual Meeting, Hotel Schroeder, Milwaukee, Wisc.

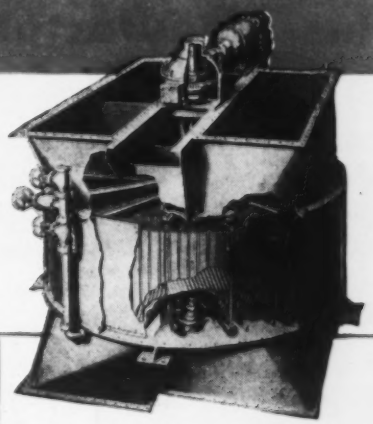
For Calendar of Coming A.S.M.E. Meetings see page 407 in the editorial section

WITH A WARTIME JOB TO DO

In a wartime world where essential materials must be conserved to the limit, the use of preheated air for power plant combustion is no longer an auxiliary service. Rather, it is a key factor, accepted as essential by the designer of today's high-capacity steam generators. Many coals could hardly be pulverized without it; many high moisture fuels could not be burned efficiently without it. By improving combustion, it raises the unit capacity of furnaces. By increasing heat recovery, it conserves important quantities of fuel.

Among the several methods available for preheating combustion air, the economic balance ordinarily favors a Ljungstrom. But now the need for conserving steel adds an important new factor to the equation. Typically, a Ljungstrom Air Preheater weighs about *one-third* that of an alternate type meeting the same conditions. (In a specific case, 63,640 lb. as against over 200,000 lb.) To this direct saving, moreover, must be added the extra structural materials necessary to support the units in each case.

In recent months, every major builder of high-efficiency power plants has included Ljungstrom Air Preheaters in one or more jobs vital to America's war effort. In the coming months, we will do our utmost production-wise to carry forward the *conservation program* which the installation of every Ljungstrom Air Preheater sets in motion.



The *continuous regenerative counterflow* principle of the Ljungstrom Air Preheater accomplishes the maximum transfer of heat from flue gas to combustion air with the minimum of equipment weight and size. An informative bulletin explaining how this is accomplished will be sent on request. Just write:

THE

AIR PREHEATER

CORPORATION

Executive Offices: 60 East 42nd Street, New York, N. Y. • Plant: Wellsville, New York

Every day of every year—this Manufacturer Dishes it out to his Clevelands!

Here's a job that dishes out nothing but punishment to its speed reducers all the time—a job that Cleveland Units have licked consistently since 1929.

The largest Manufacturer in his Industry—now fully engaged in War production—has more than 100 Cleveland Worm Gear Speed Reducers that have never let him down.

His statement "Clevelands help us avoid shutdowns" is an extra-fine tribute—

For not only must he run his plants day and night, but must keep each machine working continuously.

Even a brief shutdown could stop operation for weeks.

Insure peak production by the machines *you* build. Install Clevelands!

The Cleveland Worm & Gear Company, 3264 East 80th Street, Cleveland, Ohio.

Affiliate: The Farval Corporation, Cleveland, Manufacturers of Centralized Systems of Lubrication

In Canada: PEACOCK BROTHERS LIMITED

CLEVELAND WORM GEAR Speed Reducers

The Standards COLUMN

News of Interest to Manufacturers

Code for Pressure Piping

By the time that this issue of *Mechanical Engineering* reaches our readers the revision of the present American Standard Code for Pressure Piping should be on its way to the American Standards Association for approval. The letter ballot of the sectional committee was canvassed on February 2, 1942 and on February 11, 1942 the editing committee discussed the comments received with the ballots at a full-day meeting held in New York. This meeting ordered a supplementary letter ballot on a revision of one of the footnotes of Tables 3, 6, 23, 27, 34 and 42.

Following the completion of this supplementary letter ballot the material forming the seven sections was then corrected, paged, and the necessary cuts produced.

As reported in the March, 1940 issue of this publication the task of revising the American Standard Code for Pressure Piping was begun in 1937 by a reorganized committee numbering ninety specialists in every branch of piping from the design of the installation and the manufacture of the pipe, fittings, and equipment to the installation and testing of the finished job. Mr. E. B. Ricketts is chairman and F. A. Lydecker, secretary of Sectional Committee B31 and the several subcommittees have been led by Sabin Crocker, "Plan, Scope and Editing"; Alfred Iddles, "Power Piping"; J. S. Haug, "Gas and Air Piping"; A. B. Stickney, "Refrigeration Piping"; A. D. Sanderson, "Oil Piping"; G. K. Saurwein, "District Heating Piping"; F. H. Morehead, "Piping Materials and Identification"; and Ludwig Skog, "Fabrication Details".

Through the instrumentality of a joint conference committee special effort has been made by the sectional committee to reach an agreement with the A.S.M.E. Boiler Code Committee with regard to requirements covering steam and water piping forming part of a boiler installation. The importance of harmonizing the requirements of the two codes has been emphasized in recent years since the Boiler Code rules have been interpreted as covering a large part of the superheated steam and boiler feed-water piping. Agreement was reached on several items. For instance, the values of allowable stress for use in connection with the pipe wall thickness formulas have been made the same. Both committees agree to use the modified Barlow formula throughout the entire size range and both permit also the use of the Lamé formula as an alternate under the same conditions of size range and wall thickness.

For further information—Address

The American Society of Mechanical Engineers

29 West 39th St., New York, N. Y.

• Keep Informed . . .

Announcements in this section are supplied by current advertisers in MECHANICAL ENGINEERING and A.S.M.E. MECHANICAL CATALOG. This section is restricted to these advertisers.

- *NEW EQUIPMENT*
- *BUSINESS CHANGES*
- *LATEST CATALOGS*

Available literature may be secured by addressing a request to the Advertising Department of MECHANICAL ENGINEERING or by writing direct to the manufacturer and mentioning MECHANICAL ENGINEERING as a source.

• NEW EQUIPMENT

Taylor Submarine Thermometer

The new Taylor 5-inch industrial thermometer answers your question of what type thermometer to use in a limited space or on equipment subject to vibration.

Designed for Navy use, this latest development of Taylor Instrument Cos., Rochester, New York, lends itself to Diesel engines, air compressors, lubricating lines on motors, generators or reduction gears, small diameter brine, steam or water lines, and many other applications.

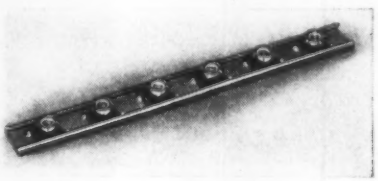
This new thermometer's one-piece construction eliminates separate front or top caps which might loosen under vibration; the sturdy glass front is held solidly in place by a string bezel, yet comes off easily when desired.

The Taylor Submarine Thermometer offers two types of separable socket connections, making it exceptionally easy to install and remove; choice of connection offered to suit the application. Available in straight, angle, right side angle, left side angle, or oblique stems to afford best angle position for any location.

For further details write the Taylor Instrument Cos., Rochester, N. Y.

Elastic Stop Gang Channel Nuts Available for Testing on Industrial Applications

Elastic Stop gang channel nuts, widely applied in the aircraft industry, are now offered by the Elastic Stop Nut Corporation, 2375 Vauxhall Road, Union, New Jersey, for testing on the many applications in general industry where a multiple, self-locking, bolted fastening is required. These strips of self-locking nuts have the approval of the military and civil air authorities and are used on all American-built military and transport aircraft, on fuselage and wing structures, engine cowlings, cover and inspection plates, around windows and doors, and at other points where a series of fastenings is required.



The strips are factory-assembled, and it is necessary only to rivet or otherwise fasten them to the structure where they are to be used. They consist of specially designed Elastic Stop Nuts, with four lugs at the base and installed at specified intervals in a metal channel strip which is preformed to accommodate the nut lugs under longitudinal flanges. The channel strip is pierced for the required nut size and spacing, and the nuts are held in place by dimples in the channel, tolerances permitting them to be virtually self-centering.

In application, the assembled gang channel is permanently attached to the structure with bolt holes aligned with those in the structure. As in all Elastic Stop Nuts, the locking action is obtained with a vulcanized red fiber collar which resists the entry of the bolt. This action forces the nut outward, creating a constant metal-to-metal pressure-contact throughout the threads of nut and bolt, taking up all axial play, and creating a cushion against vibration stresses, and impact. The fiber locking element retains its resiliency permanently and is not subject to fatigue under the most severe conditions of vibration.

Of special advantage is the fact that, although gang channel nuts are permanently mounted to the structure, it is possible to remove or replace individual nuts should this be necessary because of damage in application or in use. A nut may be easily removed from the channel by inserting a thin screwdriver between the flange and the nut and drawing it sharply toward the flange. The nut will snap out of the channel. To replace a nut, it is placed on the channel strip so that two of the lugs are under the flange, the other two resting on the opposite flange. A sharp blow with a hammer directly on the top of the nut will snap it into position. In neither case is it necessary to remove the channel from its permanent attachment to the structure or to disturb the remaining nuts in the unit.

Elastic Stop gang channel nuts are furnished in standard six-foot straight lengths in a wide variety of nut sizes, thread systems, spacing, materials, and finishes. Nut sizes range from No. 8 through $^3/_8$" bolt diameters. Spacings vary from $^5/_8$" to 3" between centers, depending upon the size of nuts and the character of the application. The nuts are furnished without countersink for regular blind mounting or countersunk for flush mounting.

Navy 'E' Awarded Crane Packing Company

In company with other leading defense manufacturers throughout America, the Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill., is the first in its industry to be awarded this coveted honor by Secretary of the Navy, Frank Knox, for production achievement and its high record for shipping Navy Materials on schedule. The Crane Packing Company has been a Navy Contractor for more than 20 years and its metallic, fabric and plastic packings are known throughout the 7 seas in both Naval and Marine services. In addition to the marine services, John Crane Packings are broadly distributed throughout the industrial, chemical and petroleum world.

Utility to Install 34.5-Kv Gas-Filled Cable

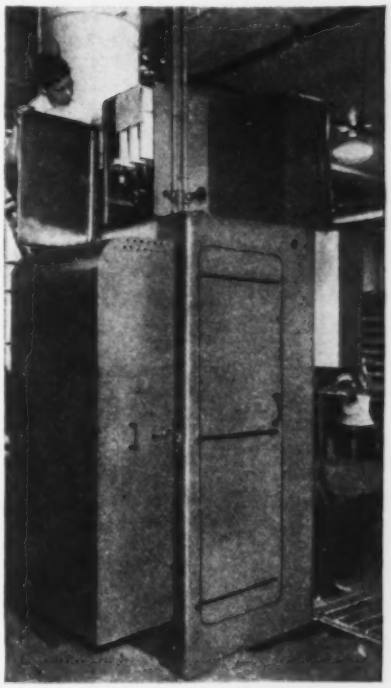
As one means of protecting power it is supplying to an important war production plant, a midwestern utility company will soon install 40,000 feet of gas-filled cable of a higher voltage rating than any used heretofore. It will be of the three-conductor type for 34.5-kv service and will be furnished by the General Electric Co. Installation will be underground.

The first installation of gas-filled cable was made in 1938, and was for 15-kv service. Installations for 27-kv were made later, but that is the highest voltage at which gas-filled cable has been operated up to the present.

The cable permits immediate detection of any damage to its lead sheath. Dry nitrogen gas is maintained at a pressure of about 12 lb inside the sheath. Damage severe enough to cause a leak announces itself at the power station in the form of lowered gas pressure and a visible and audible alarm.

G-E Breakers for Co-ordinated Welding Machine Design

Air circuit breakers which can be incorporated as an integral part of resistance welding machines by their manufacturers are now available from the General Electric Co. In most cases heretofore, welding machines have been sold without a protective device, and it has been up to the purchaser to add one to the equipment. The present trend is toward the co-ordination of the protective, and also control and timing, devices in the welding machine as standard equipment.

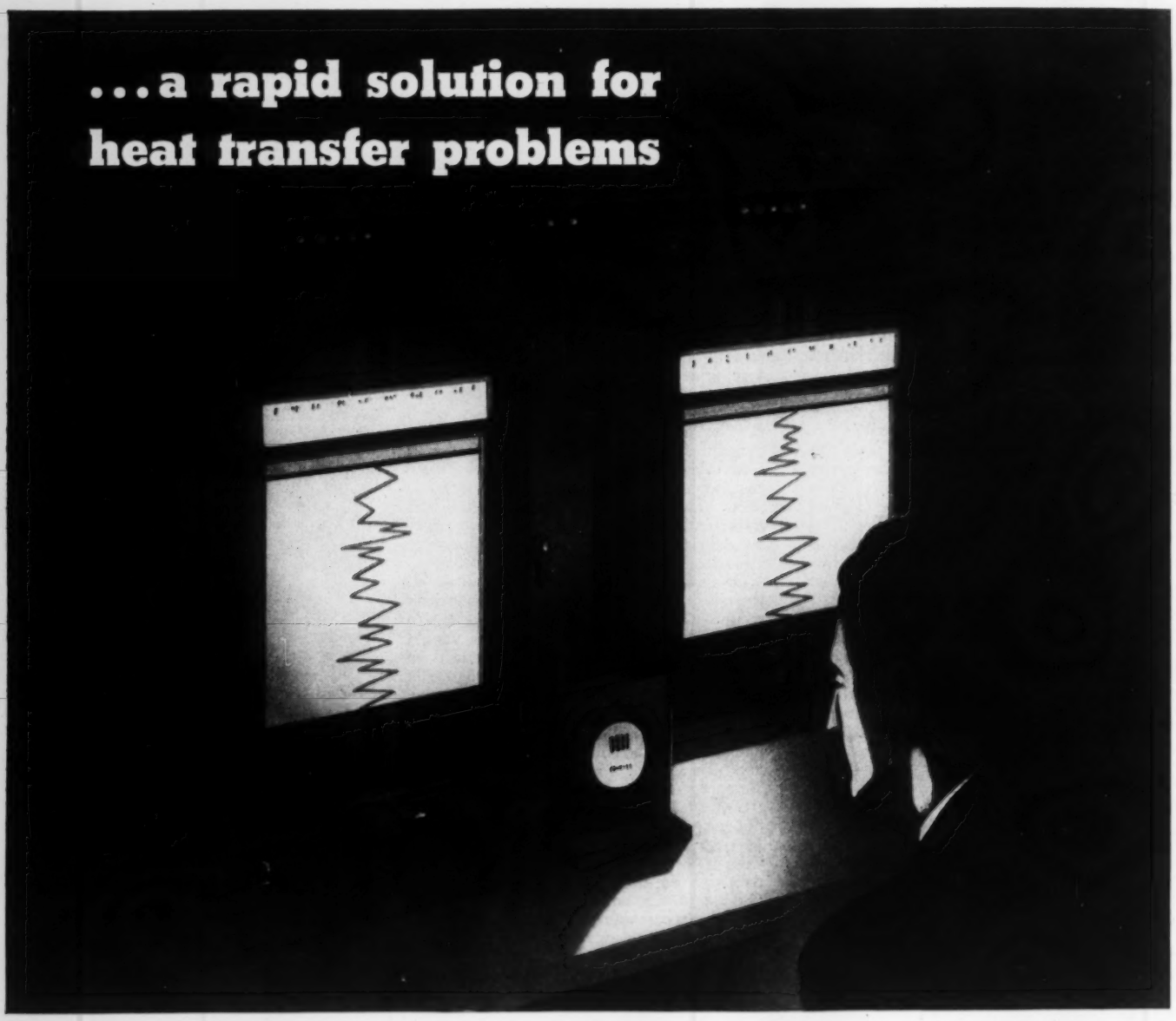


G-E's breakers offered for the purpose are designated Types AE-1AY1 and AE-1BY1. They are metal-enclosed and can fit behind the steel panels of the welder. The breakers can be removed easily for inspection by unscrewing two screws in the breaker case. Power is entirely disconnected from the breaker when it is removed, providing complete safety for the inspection.

The breakers have a wide range of calibration, offering a choice of trip settings which provide full protection and still allow maximum output of the tube. They can be

Continued on Page 23

...a rapid solution for heat transfer problems



Information supplied by "Mechanical Engineering"

Dr. Victor Paschkis, of Columbia University, has developed a rapid, inexpensive, and highly accurate method for the solution of heat-transfer problems.

Operation is based on the proved mathematical similarity of certain thermal and electrical phenomena. The method is accurate because easily made and recorded electrical measurements are substituted for difficult and erratic thermal measurements.

When the temperature and thermal characteristics of substances are known, solutions are quickly obtained. But the method is also applicable to substances whose thermal characteristics are unknown.

Such diverse problems as heat loss in building materials, determining the time-temperature gradients in turbine rotors, or the thermal characteristics of plastics, are quickly and accurately solved.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.
MOLYBDIC OXIDE—BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"

Climax Molybdenum Company
500 Fifth Avenue • New York City

MOLY

arranged to open the circuit in case of undesirable conditions such as "low-voltage" or no "water flow," and also to close the circuit remotely by means of a push button. They dispense with tube replacements and respond immediately to reduce tube failure and minimize burning of material.

New Industrial Humidifier

Now available for textile mills, paper and printing plants and other industries where control of humidity is important in manufacturing, or for the storage of hygroscopic materials such as chemicals, leather, etc., is a new industrial humidifier just announced by E. T. Murphy, vice president in charge of marketing, Carrier Corp.

Low cost humidification is provided with the unit which is compact, easily installed and low in power consumption. Ceiling suspended for saving floor space, the industrial humidifier may be moved readily to accommodate equipment layout changes. Suitable for use in single or in multiple, the unit affords flexibility when mill extension or alterations are made.

Available in two capacities, the Carrier Industrial Humidifiers will provide 4800 or 6150 cubic feet of humidified air per minute, and evaporate up to 96 pounds of water per hour.

Not only humidifying the air, the unit cleans, circulates and heats the air during winter. In summer the unit may be operated to provide evaporative cooling, cleaning and uniformly circulated air.

Built in two sections to facilitate handling, the unit, designated as the Carrier type 43G, includes fan and motor, humidifier pack, heating coil, drip pan, dampers, lint catcher and housing. Attractive in appearance with rugged construction, the unit has all its parts easily accessible for inspection and servicing.

All details are presented in a descriptive publication (43G-1) recently published by Carrier Corp., Syracuse, N. Y.

New Haering Corrosion Inhibitor

The D. W. Haering & Co., Inc., Research Laboratories in Chicago, announce development of a new corrosion inhibitor identified as ferri chrom glucosate. This new inhibitor is the ferric salt of quachrom glucosate and introduces a non-oxidizing chromium inhibitor for the first time. Ferri chrom glucosate controls corrosion in some applications in concentrations as low as two parts per million and may be employed in reducing equilibria and at low pH values for corrosion control.

Ferri chrom glucosate is a colloidal gel which may be used for film formation in process operations by dipping or spraying or may be incorporated in paints or lubricants for corrosion control.

Ferri chrom glucosate contains very little chromium and is non-irritating to handle. Its use for corrosion applications may reduce chromium consumption for this purpose as much as two decimals at the same time providing more effective control.

Complete information regarding this important new development may be obtained from D. W. Haering & Co., Inc., 205 W. Wacker Drive, in Chicago, Ill.

Two Million Documents Recorded on Microfilm

Through the use of microfilming equipment a story of the electrical industry's growth since the early 1880's is being transferred from two million sheets of old Irish linen and drawing paper to movie film at the Westinghouse East Pittsburgh works. An acre of storage space will be cleared for productive use and a more efficient record system set up by reducing the size of tons of permanent records. When recorded on film, documents which now occupy more than an acre in floor space can be stored in a vault about 10 feet square.

More than two million of these documents will be photographed during this two-year project. To be put on 16 millimeter or 35 millimeter movie film, depending on size, are records ranging from five-inch cards to five-foot drawings. Records of typing paper size or smaller are fed into an automatic camera machine which snaps the pictures at an average rate of 35 a minute. Larger ledger sheets, engineering drawings and tracings are photographed by a 35 mm. camera suspended above a table. The distance between camera and table is automatically adjusted to the proper focus.

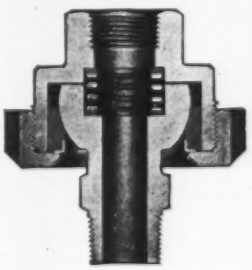
Old shop orders, sketches, drawings and charts which have accumulated from the time the Company was organized 56 years ago are all being photographed. Plans and sketches of the first alternating current equipment produced in America in 1885, the early generators that harnessed Niagara Falls in 1896, the first electrical apparatus to drive ships in 1912 are being taken from the archives. On one drawing was written the name William Stanley, and the date 1882. It was the same Stanley who three years later developed the modern electric transformer—the key machine upon which George Westinghouse based the alternating current system. This particular drawing concerned Stanley's earlier experiments in incandescent lighting and was embellished with colors and fancy art work. Some of the drawings went through the Pittsburgh flood of 1936 and had to be salvaged from six feet of muddy water. Thousands of tracings were actually sent to the laundry where they were washed and ironed.

Filing cabinets are eliminated. The savings in sheet steel required for such cabinets marks another step in the Company's effort to conserve important metals for the war effort. Each year 25 steel filing cabinets have been installed for the tracings of engineering drawings alone. These and similar bulky cabinets now occupy an estimated 50,000 square feet of floor area. Most of the cabinets can be eliminated and this space put to more productive use. Previously, two steel filing cabinets were required to hold 2,700 shop orders. When recorded on 16 mm. film, these same orders will fill just one film roll of 100 feet which fits into a box about as large as two cigaret packages. One roll of 35 mm. film will record more than 800 drawings the size of newspaper sheets. To assure safekeeping for these vital industrial records, a master file of the microfilms will be stored in a fireproof, burglarproof vault. The film rolls will be placed in a series of asbestos compartments behind double doors which are locked by combination.

Three other complete files will be located elsewhere in the East Pittsburgh works, however, for quick reference use. A special projector or "reader" enables engineers to see the enlarged picture on a screen and photographic enlargments can be printed if working copies are needed for use as blue prints.

One of the readers is being placed in each manufacturing division office. Installed in the plant photographic section will be the

Continued on Page 24



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IT'S EASY TO REGRIND THESE LUNKENHEIMER VALVES

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Valve regrinding is really a simple operation . . . it can be done so easily and quickly without taking the valve from the line.

And in this critical period when savings in maintenance time mean so much toward total production . . . even the time saved in the regrinding operation over valve replacement is of vital importance. All parts of Lunkenheimer Regrinding Valves are renewable. A few parts available for an emergency can also save much valuable time.

Since virtually all materials used in the manufacture of valves are on the list of critical materials, valve users are urged to furnish the highest possible preference ratings on their orders. This will be of mutual helpfulness.

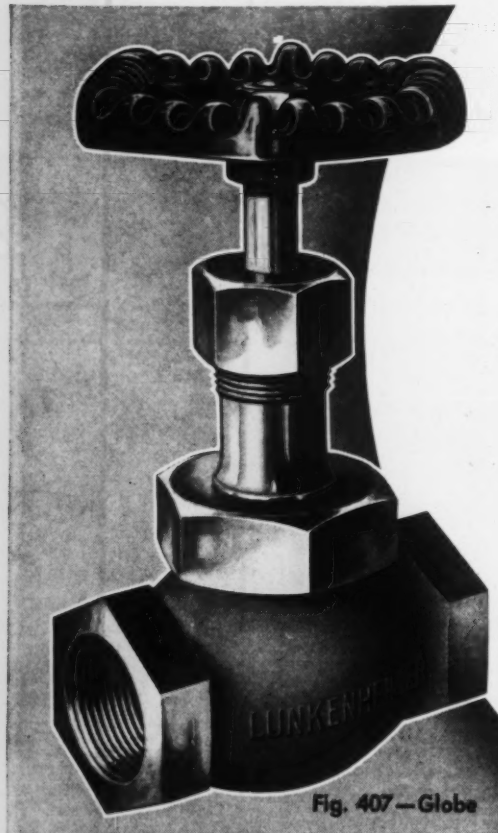

Fig. 407—Globe

Fig. 414—Lift Check

Fig. 554—Swing Check

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LUNKENHEIMER VALVES

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camera equipment which takes the original film pictures.

Company accountants will install microfilming equipment to handle the recording of ledger pages. Such substitution of small film rolls for cumbersome ledger books is expected to achieve similar savings in time, space and materials.

Microfilming has been used at the Westinghouse Sharon works for about a year. The first 80,000 shop orders filmed were taken out of 275 steel cabinet drawers and put on film that required just three-quarters of one drawer.

Ink-Like Results at Pencil Speed on Post's Penciltex

Tuned to wartime necessity, Penciltex, Post's pencil tracing cloth enables draftsmen to turn out far more work in a given time than ever before—it helps immeasurably to make up for the demands put on an already over-burdened profession.

Every pencil mark or line on Post's No. 124 Penciltex is dense and sharp because the processed, velvety surface of this tracing cloth takes pencil perfectly. It is tough, durable and will not discolor with age. Its glossy, stay-clean back is an added feature and its extra transparency adds speed to print production.

Because of the high degree of transparency and the texture that results in ink-like density from hard pencil, you will get "jet-black-on-pure-white" positive prints as well as nice, sharp, major-contrast blue prints from pencil tracings on Penciltex.

Penciltex is an anti-smudge tracing cloth. It permits the use of a 5H or harder pencil and produces the same dark, dense line as a 2H or 3H on ordinary tracing cloth. Detail made with a hard pencil will not smudge or rub off. Penciltex erases cleanly and quickly with an art gum or soft eraser and erasures will not show on the blue print.

It is available in 20 yard rolls in widths of 30, 36 or 42" or in sheet sizes to fit your needs.

Allis-Chalmers Announces New Load-Center Unit Substations

New standardized load-center unit substations are now available in sizes ranging from 100 to 2000-kva, according to an announcement by the Allis-Chalmers Mfg. Co., Milwaukee, Wis. These compact, coordinated, factory-built units can be installed anywhere in industrial plants or power distribution centers, saving valuable headroom, floor space and long secondary runs of heavy copper.

Extremely flexible, the standard unit substations offer a wide choice of incoming- and outgoing-line arrangements. The substation consists of a metal-enclosed incoming-line section, a throat-connected transformer and a low voltage feeder section.

On the high voltage side, potheads, disconnect switches, oil fuse cutouts, metal-clad switchgear or direct connection through terminal box can be supplied. On the low voltage side, stationary or drawout air breakers, electrically or manually operated, are furnished. Transformers can be oil immersed, dry type, or non-inflammable Chlorextol-liquid-filled.

Complete enclosure, uniformity of appearance, absence of exposed leads, buses and splices—all make the load-center unit substation an attractive addition to industrial plant or power distribution center.

Installation of the standard unit substations is quick and easy—the two or three component sections shipped from the factory are simply throat-connected and the power leads attached. Standard load-center unit substations are available for either indoor or outdoor service.

• Keep Informed . . .

Absolute Pressure Gages

The Brown Instrument Co. announces the addition of the Brown Absolute Pressure Gauge to its well-known line of industrial indicating, recording and control instruments. Many processes in industry today require accurate measurement and control of absolute pressure to insure uniformity of product or to maintain the highest yield of a desired constituent.

This new instrument fulfils the need of the Chemical, Petroleum, Power and Food Industries for an absolute pressure gauge to accurately measure and control pressures which are low enough to be seriously affected by variation in barometric pressure; that is, pressures below standard atmospheric pressure.

Because of the extremely low pressures which the gauge is to measure, considerable care is taken in the selection of material and the method of construction. By this extreme care in its construction and the inherent advantage of the opposing bellows design, the Brown Absolute Pressure Gauge is definitely superior in performance.

Bulletin No. 70-11 fully describes this new instrument. Included in the bulletin are specifications . . . forms and models available . . . advantages and outstanding features of the instrument and other pertinent information. Large, clear photographs show the exterior and interior views of the Brown Absolute Pressure Gauge.

A copy of this bulletin may be secured by addressing The Brown Instrument Co., 4486 Wayne Ave., Philadelphia, Pa. and asking for Bulletin No. 70-11.

• BUSINESS CHANGES

A. J. Moses Elected C. E. C. Vice President

The election of A. J. Moses as a vice president of Combustion Engineering Co., Inc., 200 Madison Ave., New York, N. Y., was announced by J. V. Santry, president of the Company following recent action by the Board of Directors.

Mr. Moses, a graduate of Georgia School of Technology, has been connected with Combustion Engineering Co., or its constituent companies, since 1920 and for several years past has been General Manager of the Company's Hedges-Walsh-Weidner Div. at Chattanooga. He will continue to be responsible for operations of this major manufacturing division which is now engaged almost entirely in production related to the war effort.

An authority on welding and X-raying, Mr. Moses is the author of numerous articles and society papers on welding and the fabrication of welded pressure vessels. His technical society memberships include the American Society of Mechanical Engineers, the American Society for Testing Materials, the American Welding Society and the Chattanooga Engineers Club, several of which he has served on important committees.

American Locomotive Co. Elects Directors

Four directors—J. B. Ennis, Frank J. Foley, Charles G. Hardy and Lewis L. Clarke—were re-elected at the annual meeting of the stockholders of American Locomotive Co., April 21, at the company offices, 30 Church street, New York, N. Y. They will serve for three years.

In a report to the stockholders, William C. Dickerman, chairman of the board, reviewed expansion of its seven manufacturing plants to handle the increasing volume of war production. The company, heavily engaged in ordnance production since 1940, delivered during the first quarter of 1942 war material equaling total ordnance shipments during the entire twelve months of 1941.

Orders on hand, Mr. Dickerman told the stockholders, now total approximately $350,000,000. Normal expectancy is that this will reach $500,000,000 within the next 60 or 90 days.

"During 1941 your company delivered to U. S. and foreign railroads, steam locomotives valued at $10,148,496," Mr. Dickerman said. "This compares with deliveries valued at $13,621,281 during 1940. It also delivered diesel locomotives valued at $12,956,861, which compares with $7,227,752 for the preceding year."

At its Schenectady plant recently the company celebrated the delivery, one year ago, of the first M-3 medium tank built by private industry in this country. Robert P. Patterson, under secretary of war telegraphed the 7,000 employees at the Schenectady plant, congratulating them on their "splendid record . . . for going 130 per cent ahead of schedule in a single year."

Continued on page 26

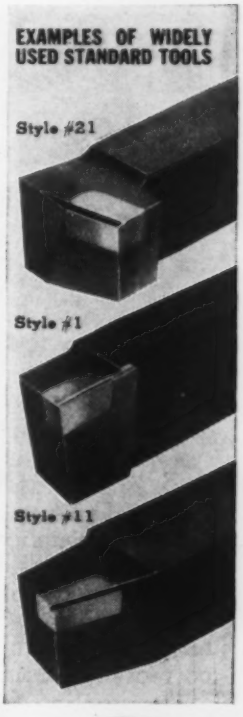
Equip Your PRESENT MACHINE TOOLS for DOUBLE PRODUCTION At Small Cost

LET KENNAMETAL HELP YOU HELP THE WAR EFFORT

There are two ways to speed up the production of steel parts for the guns, tanks, ships and planes we need so much. The first is to acquire more floor space and install more machine tools—a time-consuming and expensive method.

The second way is to install KENNAMETAL tools on your present machines. KENNAMETAL turns, bores and faces steel up to 550 Brinell at speeds 2 to 6 times faster than are possible with high speed steels, removing 3 to 10 times as much metal between regrinds. It can help you double the output of steel parts with equipment already in use.

Write today for the new KENNAMETAL Vest Pocket Manual. It contains simple, complete instructions for selecting and using KENNAMETAL tools.



KENNAMETAL THE All American CARBIDE

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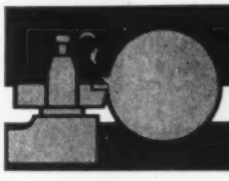

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Mr. Patterson's telegram follows:

"On the anniversary of your first delivery of an M-3 medium tank the army commends you for your splendid record in producing these tanks. We cannot lose this war when we have such whole hearted cooperation as you have shown in going one hundred thirty per cent ahead of schedule in a single year. Keep up the good work. Your tanks are being used to protect your families, your homes and your way of life."

General Electric Engineers Advanced

Ira A. Terry, for the past two years assistant to J. D. Harnden, engineering assistant to the manager of General Electric's largest plant, has been appointed general assistant to H. A. Winne, G-E vice president in charge of design engineering, Apparatus Department, it has been announced by the Company. Walter C. Heckman of the G-E Turbine Engineering department has succeeded Mr. Terry in the Works Manager's office.

Mr. Terry was born in Ogden, Utah, attended Weber College in Ogden and was graduated from the University of Utah in 1925 with a B.S. in electrical engineering. He immediately entered the employ of General Electric as a student engineer on the "Test" course. While on test, he studied at Union College and in 1929 received the degree of M.S. in electrical engineering. He also completed General Electric's three-year advanced course in engineering in 1930. In February, 1933, he was appointed assistant engineer of the Motor and Generator Engineering department, and in June, 1940, was advanced to the position he held at the time of his recent appointment.

Mr. Terry is a fellow of the American Institute of Electrical Engineers, a member of Phi Kappa Phi, honorary scholastic fraternity, and of Theta Tau, honorary professional engineering fraternity.

Mr. Heckman, a native of Pekin, Ill., was graduated from the University of Illinois in 1920 with a B.S. degree in electrical engineering and received an M.E. degree from that university in 1926. In 1920 he became a student engineer in General Electric's "Test" course, subsequently being transferred to the Turbine Engineering department. In 1931 he was appointed engineer of the Rotor and Diaphragm section of that department, the position he held until his recent promotion.

Mr. Heckman has been the recipient of two Charles A. Coffin Foundation awards, one in 1934 and the other in 1941, both for improvements in turbine design.

A member of the New York State Society of Professional Engineers, he is also a member of Sigma Tau, professional engineering fraternity, and of Eta Kappa Nu, honorary electrical engineering fraternity.

Robins Conveying Belt Co. Appointments

H. Von Thaden, Vice-President of the Robins Conveying Belt Co., Passaic, New Jersey, announces that Alfred S. Otton is relieved of his former duties as Advertising Manager in order that he may handle important productive assignments in connection with the war work now being done by the Company. Mr. Otton will, in addition, be responsible for both the sales and production end of the Screen Cloth Department at Passaic.

John M. Lupton, formerly Assistant Advertising Manager, has been promoted to the position of Advertising Manager. He will be responsible for all the various functions of that Department.

Walter Geist Elected President of Allis-Chalmers

Max W. Babb, Board Chairman of the Allis-Chalmers Manufacturing Co., announced that Walter Geist had been elected President of the mammoth company at a meeting of the Board of Directors held in Milwaukee on May 7. In this capacity Mr. Geist will replace W. C. Buchanan, whose resignation was forced by ill-health a few weeks ago.

Thus, a man who entered the company's employ as an errand boy in 1909, now at only 48 years of age, takes over control of this company which produces a greater diversity of capital goods than any other company in the world.

The story of the rise of this once struggling and ambitious youngster, who pulled himself up to his present position by his bootstraps, is the story of free enterprise and its incentive to ambition; it's a story of the American way of life.

Being a member of a large family, he had to get out and hustle early in life. There were other and younger mouths to feed, and the burden on his father was great, so, at 16 years of age, Walter Geist quit school and took a job as errand boy in the Saw Mill Engineering Department of the Allis-Chalmers Co. From that job, he advanced to a tracer, draftsman, designer—accumulating experience and a broad knowledge of the various products of the company as he progressed. When he was 31 years old, he was made Engineer-In-Charge of Trans-

mission. This was a fine achievement, but it stopped him in his tracks, for, now he had gone as far as he could in his department.

He decided that he must stay where he was or create an opportunity for himself, so he took stock of his knowledge and training and then surveyed the transmission field with a view to finding some trouble spot where his knowledge might be the solution. He found that American textile mills had never had a satisfactory short center drive. Drives in use jerked or slipped, tore fragile threads. Belt dressings and lubricants fell on processed goods, making them unsalable.

He set about solving this problem, and, after two years of experimentation, failure, and disappointment, finally struck on a new approach which resulted in the development of the multiple V-belt drive, since known as the Texrope V-Belt Drive, which has, since 1925, resulted in a volume of over $30,000,000 to Allis-Chalmers.

After developing the "Texrope V-Belt Drive" for the textile industry, Mr. Geist saw the possibilities that it offered in other industries, so started to market it. As he pushed ahead on this job even more applications developed until the Texrope Drive Division, a very small sub-division of the company's Milling Department, soon became bigger than the Milling Department itself. His accomplishments drew the attention of management, and, in 1928 he was made Assistant Manager of the entire Milling Department.

The extensive traveling he did in establishing markets for the Texrope Drive put him in constant contact with the company's many district offices. During this period, he acquired so intimate a knowledge of the personnel and the workings of the district offices, that in 1933 he was made General Representative of the Allis-Chalmers Company, in which position he was in charge of the personnel of its fifty-two district offices, foreign and domestic, all dealers, sales promotion and advertising.

The manner in which he handled this job was recognized in 1939, when the Board of Directors made him a Vice-President of the company.

The importance of the Texrope Drive to American industry was recognized in 1940, when a committee of distinguished scientists, headed by Dr. Karl T. Compton, President of the Massachusetts Institute of Technology, awarded Mr. Geist the coveted honor of the "Plaque of a Modern Pioneer" for his research and original work in the Power Transmission Field.

In April of this year, he was made Executive Vice-President by the Board of Directors, and, one month later, was made President.

In July of last year, Mr. Geist was appointed to the committee on economical policy of the National Association of Manufacturers, and also to the resolutions committee; while last December he was elected a director of the York Ice Machinery Company, York, Pa. Allis Chalmers compressors are widely used on York Ice machinery and Geist's advice on technical matters is frequently sought by this firm.

Allegheny Ludlum Builds New Plant to Conserve Essential Alloys

Alloy steel producers, who work with the more valuable and hard-to-get materials of steelmaking, have always found it expedient to watch closely their consumption of these vital alloy metals.

Salvage is a very important part of this economy. For example, ever since 1932 it has been standard procedure with the Allegheny Ludlum Steel Corp., Pittsburgh, Pa., to salvage valuable alloy metals from such a seemingly insignificant thing as the grindings produced in manufacturing operations on the steels.

Allegheny Ludlum engineers have done much research on this subject during the past ten years, and as a result, special equipment and procedures have been developed. Even in recent peacetime years, all of the tungsten in grindings was captured and returned to the electric furnaces for remelting. The grindings from low-alloy steels were processed for reclamation, too, even though the expense of salvaging their contained alloys did not at that time justify the salvaging cost.

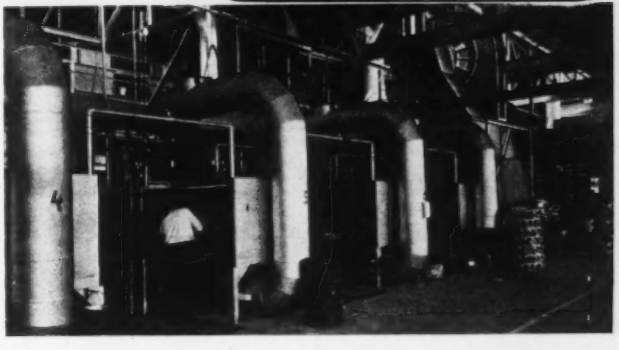
Now, however, under war conditions no strategic element can be allowed to escape, and Allegheny Ludlum's persistence in establishing methods of reclaiming low-alloy grindings is bearing good fruit—particularly since most of these steels contain our currently most essential alloys, nickel and chromium.

To increase its salvaging capacity, the company is building a new reclamation plant

Continued on Page 28

(Below) Roto-Clone combined exhausters and dust separators may be had as self-contained units comprising a dust storage hopper and filter to clean the exhausted air so it may be recirculated into the workroom.

EFFECTIVE DUST CONTROL
Keeps production lines moving Faster!



(Right) Type W Roto-Clone exhausting cleaning benches where magnesium castings are finished.

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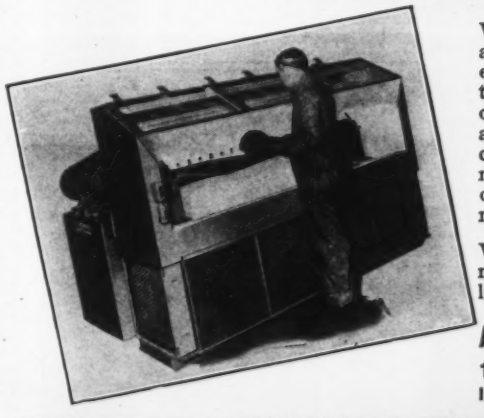
(Below) Many special applications of Roto-Clone dust control units are available such as this airplane propeller grinding bench equipped with Airmat P-L filters for air recirculation.



Vastly accelerated delivery schedules in all industries, especially those directly engaged in war production, have brought the problem of clean air to the forefront of production planning. Men who operate machines must breathe freely of clean, wholesome air and those machines must be protected from the ravages of dust that deteriorates the best of equipment and spoils materials in process.

Write today for "AAF In Industry," a new bulletin describing the complete line of American Air Filter equipment.

AMERICAN AIR FILTER CO., Inc.
103 Central Avenue Louisville, Ky.
IN CANADA: Darling Bros., Ltd., Montreal, P. Q.

Space Saving Possibilities

The De Laval-IMO OIL PUMP

is exceedingly simple and compact.

Because of absence of valves, gears and reciprocating parts it can be directly coupled to run at motor or turbine speeds. There is no vibration or pulsation.

It handles any oil against any pressure.

Ask for Catalog 1-95.

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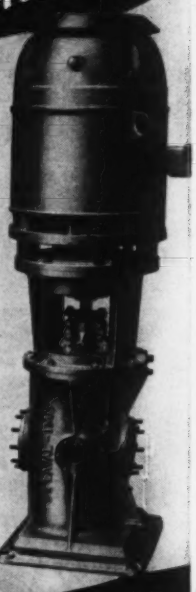
Lube oil service pump; 300 g.p.m. of 130 SSU oil from 10 in. Hg. suction to 50 lbs. per sq. in. at 1150 r.p.m.



IMO PUMP DIVISION of the De Laval Steam Turbine Company Trenton, New Jersey

IMO — I MOVE OIL

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which will concentrate on the processing of low-alloy steels to save the alloy content. Further, to eliminate losses of these alloys until the new salvaging equipment is in operation in the near future, the company has contracted with several other concerns, who are supplementing Allegheny Ludlum's present facilities for recapturing the strategic alloy particles from alloy steel grindings.

Westinghouse Elects Four New Vice Presidents

Election of four Westinghouse executives to the rank of vice president is announced by G. H. Bucher, president of the Westinghouse Electric & Mfg. Co. following action by the Board of Directors.

They are Andrew H. Phelps of Pittsburgh, Pa., manager of purchases and traffic; L. E. Osborne of Philadelphia, Pa., manager of the steam division; Frank C. Reed, of Jersey City, N. J., president of the Westinghouse Electric Elevator Co., a subsidiary; and Walter C. Evans of Baltimore, Md., general manager of radio, x-ray and broadcasting divisions. All the new vice presidents will continue in their present executive posts.

Andrew H. Phelps, general manager of purchases and traffic joined Westinghouse on January 1, 1937, coming from the McGraw-Hill Publishing Co. where, for seven years, he served as sales manager and director of public relations.

Mr. Phelps was born at Steele City, Neb. He attended the Georgia Southern Military College at Bainbridge, Ga., and was a student of accounting and law at the Brooklyn Institute of Accountancy. For five years he served as business manager of the Brooklyn Y. M C. A; then became field manager of the Chamber of Commerce of the United States. For ten years he had charge of all the district offices and the field force of the Chamber of Commerce. In 1919 he served as executive secretary of the International Trade Conference at Washington.

L. E. Osborne, manager of the Westinghouse steam division with headquarters in the South Philadelphia works, was born near Verona, Pa., near Pittsburgh. He went to work for Westinghouse as a tool clerk in the East Pittsburgh works in 1910, earning 16 cents an hour. Within six months he had been promoted to a salaried office job. To gain experience, he took a job operating a lathe. In 1915, he was given the task of training new men as tool makers. After various promotions, Mr. Osborne was appointed superintendent of the metal stamping department in 1930. He later became works manager of the meter division works in Newark, N. J. In 1934, Mr. Osborne was made works manager of the East Springfield, Mass. Works, and in 1939 manager of manufacturing and engineering for the merchandising division, with headquarters at Mansfield, Ohio. In 1941, Mr. Osborne spent several months as chief of the heavy ordnance section in the Ordnance Branch of the Production Division of OPM in Washington. He became manager of the steam division in November, 1941.

Frank C. Reed has been president of the Westinghouse Electric Elevator Co. since 1936. He was responsible for many of the large elevator installations throughout the country, one of the most important being 120 Westinghouse elevators installed in Rockefeller Center in New York City. In September, 1941, his Company was awarded the Navy "E" for excellence in production of war material.

A native of Mercer County, Pa., Mr. Reed is a graduate of Grove City College and of Massachusetts Institute of Technology. He is a veteran of the Spanish-American War. Mr. Reed joined Westinghouse in 1903 as an apprentice. After completing a two year course at the East Pittsburgh works, he was assigned to the industrial sales department and in 1921 was made manager of the Huntington, W. Va., office. In 1927 he was transferred to Chicago as general sales manager of the Westinghouse Electric Elevator Company. In 1931 he was elected vice president of the same organization and in 1936 was elected president.

Walter C. Evans, general manager of radio, x-ray, and broadcasting division, is a native of Columbus, Ohio. He joined Westinghouse in 1921, as radio operator in a broadcasting station built by the Company in Chicago. The following year he was put in charge of technical operations and in 1926 was made station manager. In 1929, Mr. Evans was made superintendent of radio operations in charge of all technical matters for the Westinghouse broadcasting stations and in 1933 also became manager of the radio division. Since 1936 he has headed the Company's broadcasting activities. His early career as a ship's radio operator followed an engineering course at the University of Illinois. During the first World War, Mr. Evans was an instructor at the Naval Radio School at Harvard University and saw service in the Navy on a submarine chaser.

Westinghouse Appoints Manager for New War Production Plant

Appointment of Gerald Z. Wollam as works manager of the new war production plant of the Westinghouse Electric & Mfg. Co., in Sunbury, Pa., was recently announced by Walter C. Evans, general manager of the

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• Here is the answer to many of your lubrication problems caused by today's production demand of heavy loads, high speeds, and continuous operation of machinery and machine tools. "Sturaco" EP Oils and Greases, without any change in your accustomed viscosity or consistency, offer a minimum of 300% *increased load carrying capacity* with notable low torque.

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Company's Radio, X-Ray and Broadcasting Divisions.

Mr. Wollam, formerly assistant manager of the Radio Division, will supervise the conversion of the idle Sunbury plant to manufacture bulkier types of communication equipment for the Government. He will be responsible for the selection and training of an initial force of 400 employees, 20 per cent of them women. The plant personnel will ultimately be considerably increased.

Without interruption to production, it is expected to quadruple the output of one of the most vitally needed types of equipment while moving into a community which has had no experience with this kind of work.

It is planned to take only a minimum of supervisors, instructors and group leaders to Sunbury from other Westinghouse plants. When the permanent organization has been established, it will consist of some key supervisors from another division, with the remainder of the personnel hired in Sunbury or the vicinity.

• LATEST CATALOGS

Crushers for Rock and Ore

"Kennedy Crusher Facts" is the title of the new Bulletin, No. 800, announced by Kennedy-VanSaun Mfg. & Eng. Corp., 2 Park Ave., New York, N. Y. This Bulletin fully describes the Kennedy Crushers. It illustrates the various types and shows applications. Actual capacities and power requirements obtained by operators in the field are given. Portable and semi-portable plants are shown.

Potentiometer Pyrometers

The Brown Instrument Co., 4486 Wayne Ave., Philadelphia, Pa., has just issued a revised catalog on Brown Potentiometer Pyrometers, No. 1105. This catalog presents clear and concise information on the design and operating features of the Brown Potentiometer Pyrometer and Accessory Equipment.

Temperature measurement by the radiation method is featured with a description and cross section view of the Brown Radiamatic Sighting Tube. A comprehensive line of installation accessories for practically all applications are illustrated. Automatic control systems are described and their operation explained. Numerous Potentiometer Controller Models and control devices are illustrated and supplemented by detailed specifications.

This catalog will be found a most useful source of information to anyone interested in indicating, recording and controlling temperatures.

Kennedy Kilns

Bulletin No. 770 just issued by Kennedy-VanSaun Mfg. & Eng. Corp., 2 Park Ave., New York, N. Y. describes the Kennedy Kilns for cement, lime, dolomite, roasting and slintering ores, drying and preheating. Applications are illustrated.

Fleet-Fillet Welding Technique for Speeding War Production

The "Fleet-Fillet" technique of arc welding, which permits up to 100% faster fillet welding and which will, thus, greatly speed up production of welded ships, tanks, guns and other war-vital products, is described and illustrated in a new bulletin just published by The Lincoln Electric Co., world's largest manufacturers of arc welding equipment, Coit Road & Kirby Ave., Cleveland, Ohio.

Published in the interests of the war effort for the guidance of war production plants seeking maximum output of ships, tanks, guns and other military and naval equipment utilizing welded construction, the new bulletin is entitled, "The 'Fleet-Fillet' Welding Technique for Speeding War Production." It contains 18 pages, 8-1/2 × 11 inches, and 36 illustrations, including photos and line drawings. Planned as ready reference material for plant production officials, welding operators and all others concerned with welding, the bulletin is concisely written and printed throughout in black ink on good quality white coated paper.

"Basically" states the foreword of the bulletin, "the 'Fleet-Fillet' technique is very simple and makes possible these important advantages: 1, faster weld production without increasing operator fatigue; 2, reduction in amount of welding electrode per foot of weld; and 3, lower welding costs."

Beginning with a 2-page review of fillet welding and a brief comparison of results with the new "Fleet-Fillet" technique and conventional procedures, also giving preliminary welding terms and definitions, the bulletin thoroughly describes the new technique. Text explanation, photos and sketches compare the "Fleet-Fillet" and conventional techniques as regards angle of electrode, weld penetration, weld strength, deposited metal and speed of welding, for both single and multiple-pass welds.

As originally announced by Lincoln, the "Fleet-Fillet" technique, described in the new bulletin, radically changes all ideas about welding speeds in production of fillet welds. Now made possible by the new technique—in a typical case—is an arc speed of 65 feet per hour for welding a 3/8-inch horizontal fillet, as compared with 30 feet per hour using conventional procedure.

Regardless of the nature of the fillet welding—whether it be single-pass, either horizontal or positioned, or multiple pass, either horizontal or positioned—the new "Fleet-Fillet" technique as described in the new bulletin, permits welding speeds up to 100% faster than conventional procedure.

The technique's full import in war production can be appreciated by considering what arc welding has already contributed to war production—even with the welding speeds heretofore available.

With arc welding, large warships are now produced in 2-1/2 years, as compared with 4 years before the process was adopted. Welded cargo vessels of the "Ugly Duckling" type are being turned out at the rate of a vessel a day, high-speed submarine chasers at the rate of one a week. Production speed of planes, tanks, guns, etc., has been similarly increased by application of welding. Now, the customary welding time for producing naval, military and industrial equipment can be further materially reduced by "Fleet-Fillet" technique, according to Lincoln. Furthermore, the cost of fillet welding by the "Fleet-Fillet" technique is reported 33-1/3% to 50% less than by usual procedure.

Continued on page 30

PERFECT REPRODUCTION
. . . and NOT by Chance!

"Opacity of line" has a positive meaning when measured by experience with MICROTOMIC VAN DYKE Drawing Pencils. Words here cannot be one tenth as convincing as the pencil in hand. It would be worth your while to try one... At accredited dealers.

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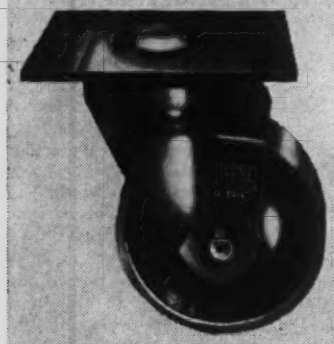

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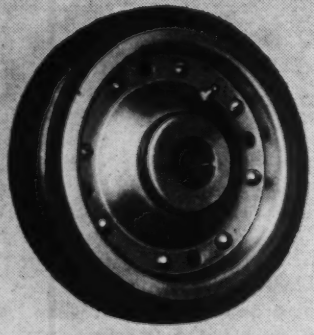

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60 WALKER ST., NEW YORK CITY

• Keep Informed . . .

Copies of the new bulletin describing the "Fleet-Fillet" technique of arc welding are available without charge from The Lincoln Electric Co., Cleveland, Ohio. In requesting copies, ask for "The 'Fleet-Fillet' Welding Technique", Bulletin 432.

Plant Offices Can Be Erected Overnight

The speedy erection of offices in industrial plants is the subject of a new illustrated folder just published by Johns-Manville. Directed to plant operators faced with the problem of providing additional offices quickly, the folder points out the versatility of Transite movable asbestos walls, which, it states, can make possible, in many cases, the complete construction of completely finished new offices overnight. Copies of the folder, Form, TR-29A, may be secured from Johns-Manville, 22 East 40th Street, New York, N. Y.

Pulverized Coal Steam Generators

Kennedy-VanSaun Mfg. & Eng. Corp., 2 Park Ave., New York, N. Y., has just issued a new Bulletin No. 41 which describes and illustrates the Kennedy Steam Generator for small and medium sized plants. Low head—low draft. Makes available high efficiency, low initial cost, and minimum of furnace maintenance. Ideally suited for smaller plants with limited head room.

Pressure Instruments

The new Taylor Pressure Instrument Catalog, No. 76JF, just announced by Taylor Instrument Companies, Rochester, N. Y., fully describes the bourdon spring, bellows and manometer type instruments for indicating, recording and controlling pressures, is now ready for distribution.

All the latest information on gauge, differential and absolute pressure and vacuums can be found in this comprehensive catalog. Also listed are the Taylor Indicating Mercury Gauges for absolute pressures and vacuums, as well as complete information on Taylor charts for pressure recorders and controllers.

Electrical Instruments

For industrial, central station, laboratory, and general use, portable switchboard and miniature panel instruments are described in a new 34-page booklet announced by Westinghouse Electric & Manufacturing Co.

Somewhat the same in format as the popular and well-known quick-selector catalog, the new publication lists all instrument types for specific applications on an instrument selector chart. Special features, specification data, and full-scale range of standard ratings are included.

Design features and physical characteristics of meter pivots, springs, pointers, and cases are described with a note on manufacturing methods and testing facilities are also included.

Reproduced in the booklet are 120 photographs, 44 representative meter dials and 13 types of strip and circular charts.

A copy of booklet B-3013 may be secured from department 7-N-20, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

Quick Selector Catalog—April 1942 Revision

A 64-page 1942 revision of the "Quick Selector Catalog" is announced by the Westinghouse Electric & Manufacturing Co. Issued twice a year, this catalog has become extremely popular, as it simplifies the selection of many types of electrical equipment.

A number of additions and changes have been made in the April 1942 edition which make the catalog more useful than ever before.

The general subjects covered include: safety switches, nofuze breakers, multi-breakers, panelboards, motor control and motors. New application data, on latest equipment in each of these groups, has been included.

Despite revisions, the general format of the catalog has been retained. Electrical ratings, physical dimensions, and circuit diagrams expedite the selection of correct equipment for each purpose.

A copy of the April 1942 "Quick Selector" Catalog 30-000 may be secured from department 7-N-20, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

Highlights Inco Magazine

Spring Edition, Volume XVIII, #2. This current issue of INCO not only "continues the record" but makes an effort to treat helpfully with present-day problems—such as the salvage of scrap, sub-contracts, and the conservation of supplies.

Of notable interest is the story on the development of the new type of rivet which eliminates blind fastening.

Other features recite the part which nickel and nickel alloys play in the production of essential wartime material, including tungsten and plastics used in the construction of military and naval airplanes.

A copy of "Inco" may be secured by addressing The International Nickel Company, 67 Wall St., New York, N. Y.

Wide Range Oil Burning System

Peabody Engineering Corp., 580 Fifth Ave., New York, N. Y., announces their new Bulletin No. 107, which explains the Peabody Constant Differential Wide Range Oil Burning System. It provides a simple, positive and flexible control of combustion over an unbelievably wide range of capacity, when required, in excess of 50 to 1. Copies will be sent on request.

Radial Arm Drilling and Routing

A new manual has just been published by The Onsrud Machine Works, 2218 N. Springfield Ave., Chicago, Ill., pioneers in the construction and application of machine and manufacturers of Onsrud Radial Arm Drills and Radial Arm Routers. It is titled "Tricks and Tips on Radial Arm Drilling and Routing" and is designed to be of practical value to operators, shop superintendents, maintenance men, and template and pattern makers. It is the first of its kind ever written, giving the complete story of radial arm drill and router operation.

The purpose of the manual is to help aircraft manufacturers obtain faster, more accurate production in one or all of these ways: (1) By aiding in the task of training new employees to operate radial arm drills and routers. (2) By offering present radial arm drill and router operators a textbook to follow for improving their work. (3) By showing the methods whereby the natural set-up advantages of these machine tools may be capitalized upon to hold scrap to a minimum. (4) By clearly presenting all the facts of maintenance in order to prolong to the limit the lives of the machines. (5) By decreasing the needlessly lost man-hours of trained aircraft employees, by stressing the importance of using protective equipment during work.

Since radial arm drilling and routing is one of the major metal working operations in aircraft today, this manual becomes an important timely aid to war time aircraft production.

• Keep Informed

The manual is offered free to any manufacturer using radial arm drills and routers—in quantities sufficient to give one to every employee concerned. At the same time others interested in learning about this relatively new machining technique are invited to write for a copy, telling the type of work they now do.

Metal Duplicating Without Dies

A new catalog has just been published by O'Neil-Irwin Manufacturing Co., 300—8th Ave. S, Minneapolis, Minn., describing Di-Acro Precision Machines and the Di-Acro System of Metal Duplicating Without Dies.

The Di-Acro System of forming or duplicating without dies is extremely versatile in its applications for producing parts or pieces of intricate shapes. Many materials besides metals can be worked. In addition to stamping and forming for small quantities, and experimental, research and testing uses—in many cases multiple units of Di-Acro Machines are proving profitable for production line work.

Electric Remote Speed Indicator

The Reeves Pulley Co., Columbus, Indiana, has recently developed a new type Electric Remote Speed Indicator for use with Reeves Variable Speed Control Equipment which still further increases the utility of Reeves Drives. Bulletin, No. G-427, fully illustrates and describes this equipment. Send for it.

Allis-Chalmers Victory Book Illustrates Industry at War

"We Work for Victory and We Plan for Peace," a dramatically illustrated brochure designed to show what products Allis-Chalmers is making under war-time conditions and where and how these products are helping to produce more guns, tanks, planes and ships, is now being distributed by this company.

Nearly every phase of the nation's industrial production is represented in the new book, since Allis-Chalmers produces a greater variety of capital goods than any other company in the world. These products, now vital in war production are, for the most part, the same Allis-Chalmers has always made.

They include power-making equipment, such as hydraulic and steam turbines; power-distributing equipment, like transformers, rectifiers, switchgear and regulators; and power-using machines, such as motors, drives and pumps. In addition, the company's products are essential in mining and processing of metals of all kinds, in cement making, road building, farming, food processing, the oil industry and scores of other industries whose production is the basis of America's war production.

Scores of war items new to Allis-Chalmers production complete this company's contribution to the war effort, as colorfully described and illustrated in the new Allis-Chalmers victory book.

The book is being distributed in conjunction with the showing of a sound moving picture with the same title and the same general theme. In news-reel style the movie brings to life many of the views shown in the book.

How to Increase Machine Flexibility With Vari-Pitch Texrope Sheaves

How to increase machine flexibility and output with quick, accurate speed-changing is the story of a new bulletin on Vari-Pitch Texrope Sheaves, recently released by the Allis-Chalmers Manufacturing Co., Milwaukee, Wis.

Continued on Page 32

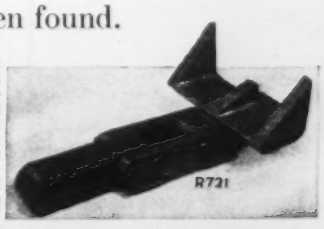
Manganese Steel is Conserving Metal for Many Industries— and the Nation . . .

Industries employing equipment whose parts are subjected to heavy impact and abrasion are contributing to the proper employment of all steel by using genuine manganese steel, "the toughest steel known," in applications where its great economy has been proved. Castings of this wear-resistant metal *seldom give less* than twice the service life of ordinary rolled or cast steel and often outlast them ten to one in the most abusive services.

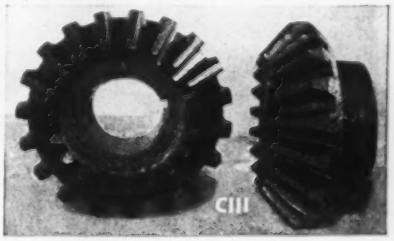
Continuous operation of equipment is an important consideration, also, in addition to savings in man-hours and metals through minimized maintenance and replacements.

Manganese Steel castings are strong and ductile throughout, but under repeated impact or heavy pressure they work-harden on the surface in use. Thus a hard, abrasion-resistant surface is presented with a tough backing which absorbs impact, withstanding stresses under which "hard through" steels would fracture.

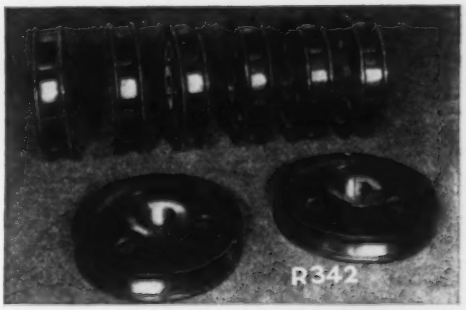
Several examples of the remarkable performance of genuine 13% manganese steel equipment parts are exhibited here. This steel is not recommended for structural, load carrying, or other everyday applications where ordinary steels are adequate, but where impact and abrasion are severe no steel as suitable and economical as manganese steel has yet been found.



R-721—A sawmill superintendent states: "Manganese steel log haul chain of pinlock design, that we are using, has lasted 9 times longer than the heat-treated steel roller type chain it replaced."



C-111—"27 years' service on our roll table line shaft," reports the master mechanic of a blooming mill, "And they're still running," praising Amsco manganese steel gears like these pictured.



R-342—A car builder recently reordered these manganese steel crane wheels to replace identical wheels that had been in service 21 years in their foundry.

Amsco

AMERICAN MANGANESE STEEL DIVISION
OF THE AMERICAN BRAKE SHOE & FOUNDRY CO.
Chicago Heights, Illinois

Manganese Steel Castings for shocks and abrasion.
Chromium-Nickel Alloy Castings for heat and corrosion resistance.
Power Shovel Dippers. Dredge and Industrial Pumps.
Welding Materials for reclamation and hard-surfacing.

FOUNDRIES AT CHICAGO HEIGHTS, ILL.; NEW CASTLE, DEL.; DENVER, COLO.; OAKLAND, CALIF.; LOS ANGELES, CALIF.; ST. LOUIS, MO. OFFICES IN PRINCIPAL CITIES

The Boeing B-17 Flying Fortress is fastened throughout, at important structural and secondary connections, with Elastic Stop Nuts.

WHEN THE BIG TEST COMES

these nuts hold tight

There are more Elastic Stop Nuts on American airplanes, tanks, and other war equipment, than all other lock nuts combined.

» Write for explanatory folder

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Elastic Stop SELF-LOCKING NUTS

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Chemical and Metallographical Laboratories—Welding Supervision, Inspection and Testing, Qualification of Operators and Procedure.
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Weld Testing—Qualification of Operators—Supervision Inspection—Research.
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RATE Announcements under this heading in MECHANICAL ENGINEERING are inserted at the flat rate of $1.25 a line per issue, $1.00 a line to A.S.M.E. members, minimum charge, three line basis. Uniform style set-up. Copy must be in hand not later than the 10th of the month preceding date of publication.

• Keep Informed . . .

Current needs for stepping up production can be satisfied frequently increasing the flexibility to machines so that they can handle more jobs at higher efficiencies. By providing stepless speed variation up to 25% with one stationary or motion-control Vari-Pitch Sheave, or a 50% variation when two Vari-Pitch Sheaves are used. Vari-Pitch Drives assure this extra machine-flexibility.

In the new bulletin, B6082-A, stationary and motion-control sheaves are described, and operating diagrams, sizes and dimensions are included.

Speed Recorders

"Micromax Speed Recorders" are described in a new 12-page catalog by Leeds & Northrup Co.

Anyone responsible for the operation of rotary kilns or dryers; machines for making rayon or other synthetic threads or sheets; paper machines; steam turbines; or other rotary equipment will be interested in this publication. It describes instruments which measure and automatically record speed of rotating machinery with high accuracy and reliability . . . making possible close speed regulation which is frequently the key to higher production, better product quality, and most efficient use of process machinery.

Showing in graphic detail the record of each day's operation, Micromax speed charts help management study past performance and set up efficient operating schedules. For operators, they provide an accurate guide for regulation, and a clear record of trends from which changing conditions can be anticipated. Anyone who wishes to receive a copy may do so by asking Leeds & Northrup Company, 4934 Stenton Av., Philadelphia, Pa. for Catalog N-27.

Ohmite Stock Items

A new, up-to-date, 16-page Catalog listing over a thousand stock items in Rheostats, Resistors, Tap Switches, Chokes and Attenuators has been issued by the Ohmite Manufacturing Co., Chicago.

This new Catalog 18 is especially useful today to engineers and purchasing departments as a quick-reference specification or buying guide. It gives illustrations, descriptions, ratings, prices and other helpful information on the wide range of Ohmite stock types and sizes—simplifies selection. There are close control vitreous enameled Rheostats ranging from 25 watts to 1000 watts—Dividohm Adjustable Resistors from 10 to 200 watts, and Fixed Resistors from 1 watt to 200 watts—all in many resistance values. Two types of Tap Switches and a wide variety of Power Line and R. F. Plate Chokes are listed. There are also many other items of general interest.

A free copy of the new Catalog 18 may be obtained by writing to the Ohmite Manufacturing Company, Department 7A, 4835 Flournoy Street, Chicago, Ill.

Details of Design

First of a new series of booklets to be distributed under the generic title of "New Departure Engineering Service", and now immediately available is: "Details of Design of shafts and housings for ball bearings."

Written for the benefit of the machine designer interested in applying ball bearings, this very helpful volume includes such subjects as proportions and finish of bearing seats; locknut threads, recommended shaft shoulders; designing to aid disassembly; locating and clamping methods and the use of adapter sleeves.

The section on Housing treats of bearing corner radii; recommended housing shoulders; straight through and shouldered housings; snap ring bearings and the use of separate snap rings; bearing housing covers; adapters in the housing; use of split housings; clamping and spacing details.

Each subject is profusely illustrated with well executed line drawings. This booklet furnished gratis to engineers and designers who address Advertising Department, New Departure, Bristol, Conn., specifying Booklet "DD".

"Kennametal" Vest Pocket Manual

McKenna Metals Co., 367 Lloyd Ave., Latrobe, Pa., has just issued a 48-page "Kennametal Vest Pocket Manual." Small in size, so that it can be easily carried in the pocket for ready reference, the new Manual contains chapters on Selecting, Designing, Using, Brazing and Grinding Kennametal tools. Complete, easy-to-follow instructions show readers exactly how to get the utmost in service from all types of Kennametal steel-cutting carbide tools. The manual is further clarified by more than one hundred illustrations. Copies will be forwarded to interested persons upon request.

Temperature Regulators

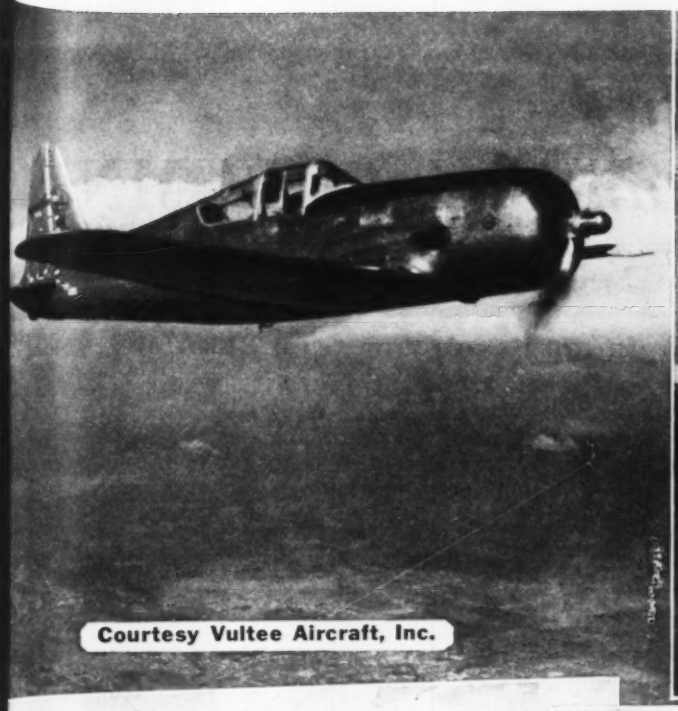
Sarco Co., Inc., 457 Fifth Ave., New York, N. Y. have just issued a new catalog covering Sarco self-operated temperature regulators for water heaters and industrial process applications. These automatic regulators are simple thermostatic valves, entirely self-contained and self-operated. No outside power, such as electricity, compressed air, or water is needed. Ask for Bulletin No. 600.

COMING MEETINGS AND EXPOSITIONS

For this month

JUNE	
1–4	Edison Electric Institute, Annual Convention, Atlantic City, N. J.
7–9	American Society of Refrigerating Engineers, Spring Meeting, Skytop Club, Skytop, Pa.
8–10	The American Society of Mechanical Engineers, Semi-Annual Meeting, Hotel Statler, Cleveland, O.
11–12	National District Heating Association, 33rd Annual Meeting, The Dayton Biltmore, Dayton, Ohio
17–19	A.S.M.E. Oil and Gas Power Division, National Meeting, Peoria, Ill.
19–20	A.S.M.E. Applied Mechanics Division, National Meeting, Massachusetts Institute of Technology, Cambridge, Mass.
21–25	American Water Works Association, Conference on Wartime Problems of Water Supply, Exhibit of Water Works Equipment, Stevens Hotel, Chicago, Ill.
22–26	American Association for the Advancement of Science, Summer Meeting, Ann Arbor, Mich.
22–26	American Society for Testing Materials, 45th Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.
22–26	American Institute of Electrical Engineers, Summer Convention, Drake Hotel, Chicago, Ill.
24	American Society of Heating and Ventilating Engineers, Semi-Annual Meeting, Hotel St. Paul, St. Paul, Minn.
27–29	Society for the Promotion of Engineering Education, 50th Annual Meeting, Columbia University, New York, N. Y.
29–July 1	American Society of Agricultural Engineers, Annual Meeting, Hotel Schroeder, Milwaukee, Wisc.

For Calendar of Coming A.S.M.E. Meetings see page 502 in the editorial section



Courtesy Vultee Aircraft, Inc.

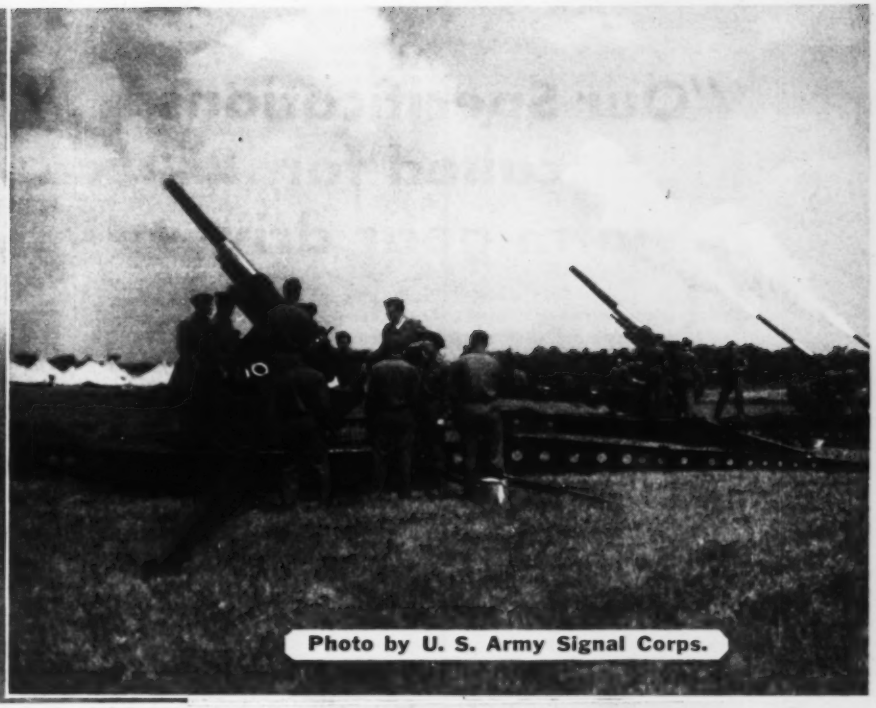
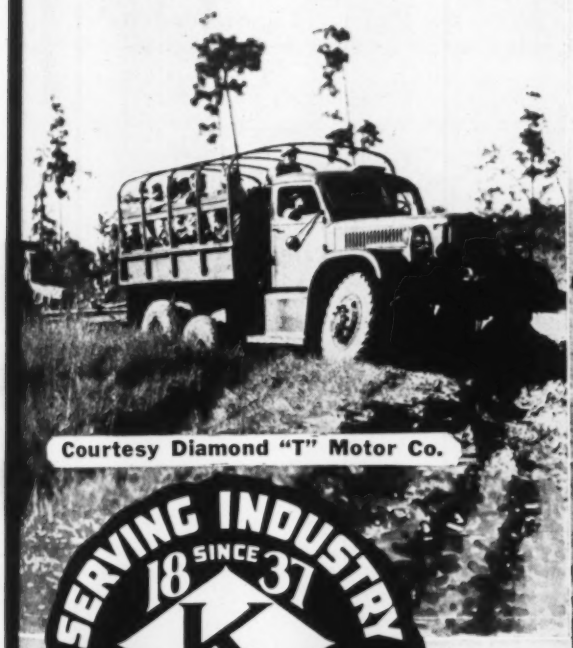


Photo by U. S. Army Signal Corps.



Courtesy Diamond "T" Motor Co.

Official U. S. Navy Photograph

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OVER 100 YEARS

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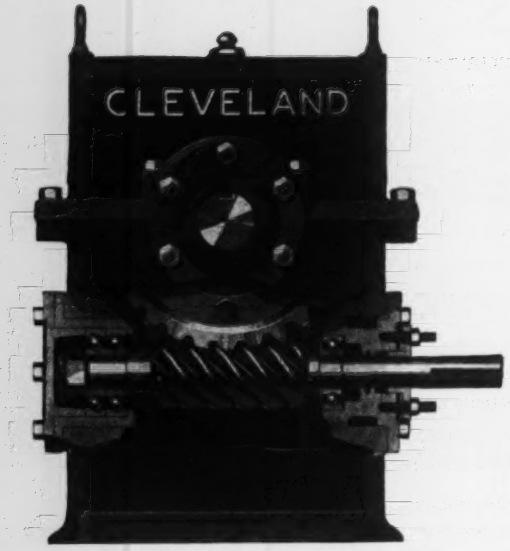
"Our Specifications called for worm gear drives



—our *Experience* called for *Clevelands*"

Look at Clevelands' record in a particularly vital war metal industry—

See them at work in this industry's great Mills—

Hear the comment of one Mechanical Engineer who has used Clevelands for many years:—

"Worm gear speed reducers simplify the transmission of power to our machines, and our good experience has led to the purchase of many of your Units." In fact, this large Corporation ordered a single Cleveland in 1926 and since then has bought more than 50 of them.

Cleveland Engineers will help you plan drives for *your* equipment that will insure the low-cost, trouble-free operation enjoyed by the other Cleveland owners in every major industry.

The Cleveland Worm & Gear Company, 3264 East 80th Street, Cleveland, Ohio.

Affiliate: The Farval Corporation, Cleveland, Manufacturers of Centralized Systems of Lubrication

In Canada: PEACOCK BROTHERS LIMITED

CLEVELAND WORM GEAR *Speed Reducers*

The Standards COLUMN

News of Interest to Manufacturers

Minimum Requirements for Plumbing

On April 16 and 17, 1942 the subgroup which is developing a draft of a proposed American Standard for Minimum Requirements for Plumbing held a two-day meeting. Mr. Albert H. Morgan, chairman of this subgroup was in the chair and the majority of the committee members were present throughout the four sessions.

This subgroup was organized in April, 1941 and since that time has held eight meetings most of which have lasted for two days. By November, 1941 it had completed tentative drafts of seven of the fifteen sections included in its program, namely, sections on General Regulations; Materials—Quality and Weight; Joints and Connections; Traps, Interceptors and Cleanouts; Hangers and Supports; Water Supply and Distribution; and Indirect Wastes and Waste Piping. These sections were released by the subgroup for general distribution to the industry and the regulatory bodies for criticism and comment. Accordingly, in mimeograph form more than 860 sets of this material were mailed between December 9, 1941 and April 1, 1942.

The response was usually large and complimentary. Two hundred and fifty letters were received which contained constructive suggestions for the improvement of the sections so far drafted. Practically all of them included such commendatory clauses as the following:

1. "The tentative draft in my opinion is excellent in form, compactness, and specifications."
2. "The publication of a standard plumbing code such as your committee is working on should be of a great deal of value to interested persons and organizations."
3. "The procedure of providing such a code by the personnel of Subcommittee No. 1 is certainly a very meritorious one, a good foundation has been laid for the benefit of this field and we are for it."
4. "After carefully looking these drafts over, we have no criticisms whatever to offer, in fact we believe they are all good and should be acceptable nation-wide."
5. "As a whole, I believe this is the best written code I have seen yet and when it is published in its final form I intend to promote its adoption for the various cities in Oregon."
6. "You are to be congratulated on the work which has been done by Subcommittee No. 1 of A40, and I hope that this standard code will be accepted and that we may have the opportunity of presenting it to our readers."
7. "This office desires to compliment the committee upon its work, because we feel that a national plumbing code in which minimum requirements are presented has long been needed for the coordination of plumbing and its related work in the country."

The subgroup at work on the "Plumbing Code" was named by Mr. Theodore Irving Coe, Chairman of Subcommittee No. 1 of the Sectional Committee on Minimum Requirements for Plumbing and Standardization of Plumbing Equipment, A40. Subcommittee No. 1 is organized on a representative basis twenty-nine national organizations having named official representatives on it. The sectional committee was, of course, organized in this way back in August, 1928. The American Public Health Association and The American Society of Mechanical Engineers are the joint sponsors for this project under the procedure of the ASA.

For further information—Address

The American Society of Mechanical Engineers
29 West 39th St., New York, N. Y.

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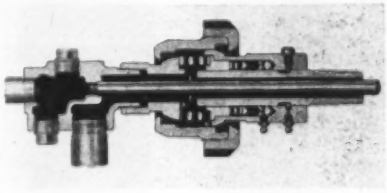
• NEW EQUIPMENT

New Barco Revolving Joint

Barco Manufacturing Co., 1807 Winnemac Ave., Chicago, Ill., announces a new type of revolving joint now being put on the market by them.



This joint is capable of handling steam, air, oil, gas, water, and other fluids, and the two ball seats permit a slight flexing angle to relieve strain on the piping due to pulling together nipples and unions.

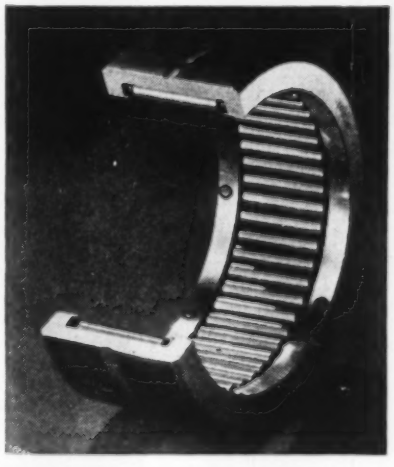
This joint is also equipped with a ball race arranged so that the sleeve has a slight tendency to move in and out for expansion of the steam heated and cooling rolls.

The chevron pack seal is also maintained by constant pressure of a spring against the packing. The joint can be repacked when necessary without removing the threaded sleeve from the roll.

This is the "Barco" Revolving Joint 7RB-8CRB. In this type the clamp previously used with "Barco" Revolving Joints has been eliminated.

Design Improvement Speeds Production of Bantam Quill Bearings

An improved method of installing the roller retaining rings of the Bantam Quill Bearing by spot-welding not only gives a sturdier, more permanent assembly, but considerably speeds up production of this anti-friction unit.



As illustrated in the accompanying sectional view, the large number of small diameter rollers are held in place in the outer race by retaining rings. Not only does the new spot welding method simplify the machining operation—thus speeding assembly—but it gives a positively located and permanently placed band which will not snap loose under any ordinary conditions.

The illustration also shows another important design feature of this compact anti-friction unit. That is, that when in service, the entire load is carried to the solid outer race—none of the load, axial or thrust, is against the retaining rings which serve solely to hold the rollers in place facilitating handling, assembly, and disassembly.

To meet the vastly increased demand for the Quill Bearing in the country's war equipment, Bantam has also completed a program for further expanding the production of this widely used bearing. Its outstanding features of high unit capacity, compact design, ease of handling and assembly—plus the simple and efficient lubrication permitted by its outer race design—make it an ideal anti-friction unit for front line equipment, such as tanks, trucks, gun mounts as well as for the machines on the production line—where dependability and long, maintenance-free service life are vital factors in performance.

Materials handling equipment, automotive assemblies, speed control equipment, many machine tool applications, and in petroleum producing machinery are among the imporant fields where the Quill Bearing has demonstrated its exceptional efficiency over the period of more than four years since it was first introduced by the Bantam Bearings Corp., South Bend, Indiana. Further information on types, sizes, ratings and other data is given in the Bantam Quill Bearing Catalog, copies of which are available on request.

Farrel-Birmingham Workers "Beat The Schedule"

Living up to their war slogan "Farrel Drives For Victory," the workers at Farrel-Birmingham Company celebrated Maritime Day on Friday, May 22, by shipping the first of twenty drives for Maritime Commission cargo vessels ahead of contract schedule.

Down Draft Dust Control System

One of the recent developments of The Kirk & Blum Mfg. Co., is the down draft system of dust control. A big feature is that dust is carried off through ducts constructed under the floor, which saves floor space and does not obstruct working areas. Bench-high gratings, through which air is exhausted, enable operators to conveniently handle castings for sanding, snagging, grinding, polishing and buffing.

The machine tool industry, in particular, has found the K & B down draft dust control system to be a decided advantage in its finishing departments. Here it is possible to grind and sand castings within a few feet of precision machinery without the necessity

of partitions or curtains. All dust particles are carried down through the gratings as fast as they are released. These surface gratings and under-the-floor ducts help maintain a clear atmosphere. Further information and catalog will be supplied by addressing The Kirk & Blum Mfg. Co., 2871 Spring Grove Ave., Cincinnati, Ohio.

Ingenious Cleaning Machine Speeds Output of Metal Specialty

A General Electric Calrod heater installed in a second-hand washing machine at the Koch Mfg. Co. of Louisville, Kentucky, is speeding the output of a small metal specialty made by this company.

After the specialty has gone through the manufacturing process it is cleaned in a liquid soap solution heated to 190 F. Formerly the solution was heated in a tank by gas, but much valuable production time was being wasted because of the excessive time required to bring the solution up to the proper temperature.

To speed the heating of the soap solution Louis A. Koch, owner of the Koch Co., devised what he calls a "jiffy" cleaner. Consisting simply of a G-E 5000-watt, 230-volt Calrod heater looped around the bottom of a washing machine, the "jiffy" cleaner brings the solution to the proper temperature eight

Continued on Page 27

Lacquer strain gage simplifies stress analysis

Information supplied by "Mechanical Engineering"

Development of a technique employing lacquer coatings to effect quantitative stress analyses is the result of work done at M.I.T. It was described in two papers at the recent National Meeting of the Applied Mechanics Division of the A.S.M.E. which will be published in The Journal of Applied Mechanics.

The technique consists in covering the surface of the body with a thin coat of lacquer which becomes brittle upon hardening. When the structure is loaded the lacquer cracks along lines perpendicular to the maximum tensile strain, giving a family of isostatic lines. The companion set of trajectories at right angles can be formed by relaxation.

The method has the advantage of being applicable to bodies with all kinds of irregular contour in three dimensions, and will yield information where all other methods fail.

It is easy to apply.

The method has a further advantage in that it requires no very complicated apparatus.

It is nondestructive in character.

As applied to photoelasticity it removes one of the major difficulties and inherent sources of error in that type of stress analysis.

In interpreting the results it should be realized that the crack pattern formed is merely a function of strain and that stresses can be derived from these rather than observed directly.

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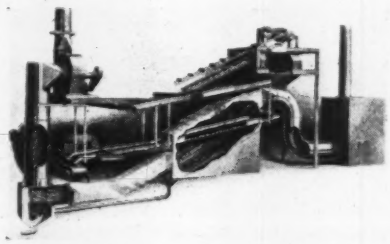
to ten times faster than by the old method, and has resulted in cooler working conditions, more accurate control of heat, and more economical operation.

The parts to be cleaned are placed in the machine in a special wire rack so that they will not strike the agitator or come in contact with the heater.

New Link-Belt Coal Dryer

Following their traditional custom of not announcing new products until they have been thoroughly tried out on actual installations, it can now be told that Link-Belt Co., Chicago, have developed a new dryer for the effective removal of surface moisture from sized coal.



This dryer, to be known as the Link-Belt 'SS" Dryer, combines mechanical dehydration with heat drying, and is available for drying sized coal of No. 10 mesh and up.

The new unit comprises a drying chamber with perforated reciprocating-plate drying surface; coal inlet and outlet; hot air inlet from a coal-fired furnace; and an exhaust fan for drawing the hot air into chamber, over and through the thin bed of coal, down through perforations in reciprocating plate, to exhaust stack.

The operation of the moving element is analogous to that of the familiar shaker screen excepting that in the case of the "SS" Dryer the perforations are very small and are intended only for passage of the drying air.

It is stated that inasmuch as the coal passes through the dryer in a thin bed at slow speed, it is thoroughly, uniformly dried with low temperature air and discharged relatively cool; also that comparatively little power is required for operation of exhaust fan and reciprocating plate.

Nordberg Navy "E" Award Celebration

On Friday, May 15, the Nordberg Manufacturing Co., Milwaukee, Wisc., celebrated the awarding of the Navy "E" Burgee to their company.

There were between 5000 and 6000 present. This large gathering included the regular Nordberg employees, specially invited guests, and guests of the Nordberg employees. Each employee had the privilege of inviting one guest. After the ceremony a complete inspection of the entire plant was made.

Many distinguished guests were present including U. S. Naval Officers, U. S. Army Officers, U. S. Government Officials and men prominent in civic life.

Among those on the program was Mayor of Milwaukee, Carl F. Zeidler, who recently enlisted in the U. S. Navy and who is now in training. He came back to Milwaukee especially for the Nordberg celebration.

Those shown in the illustration above are, reading from left to right, Hans Krogstad, the oldest Nordberg employee, who accepted the Navy "E" insignia; Rear Admiral W. H. P. Blandy, who presented the company with the Navy "E" Burgee; Robert E. Friend, President of the Nordberg Manufacturing Co.; and Captain H. A. Spanagel, who presented the first Navy "E" button to Mr. Krogstad.

Another Navy "E" for National Forge

Rear Admiral H. A. Wiley, chairman of the Navy Board for Production Awards, announced on April 17th that the ALL-NAVY "E" had been awarded to the National Forge & Ordnance Co. at Irvin, Warren County, Pa. This further recognition of excellence in production follows the Navy "E" award of the Bureau of Ordnance to National Forge which was announced by Secretary Frank Knox on Oct. 21st last year.

In sending the All-Navy "E" to National Forge, Admiral Wiley also forwarded the Navy "E" burgee which is now flown every day at the National Forge plant from a companion flagpole to the one flying the American flag. The Navy "E" burgee is an impressive swallow-tailed pennant which bears the All-Navy "E" insignia and the Navy's famous "fouled anchor." This burgee supersedes the Navy "E" pennant which was previously provided by the Navy Bureau of Ordnance.

In accordance with this reward, the official All-Navy "E" lapel pin was presented to all employees at National Forge by president John C. Harrington. This pin also takes the place of the ordnance "E" pin given to all National Forge workers last October.

Thus the importance of the work being performed by National Forge in the war program has been recognized and conveyed to all members of the organization by the Navy burgee which flies at the company entrance and the new All-Navy "E" pin which every employee is privileged to possess and wear at work and at home.

Farrel-Birmingham Company Awarded Navy "E" for All Three Plants

In recognition of excellence in the production of gear drives for Navy ships, the three plants of Farrel-Birmingham Company, Inc. at Ansonia and Derby, Conn. and Buffalo, N. Y., have been awarded the "E," traditional Navy symbol for a job well done.

Continued on Page 28

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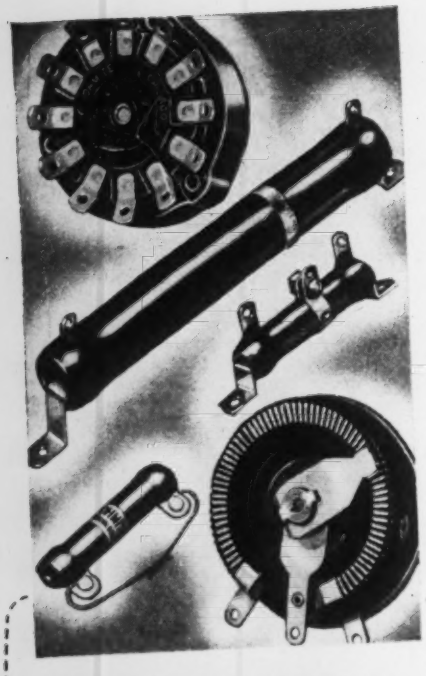

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Presentation of the award was made by Rear Admiral Henry A. Wiley, U.S.N. (Ret.), Chairman of the Navy board for production awards, and was accepted on behalf of the company by Mr. A. G. Kessler, Vice President and General Manager of the Buffalo plant. On behalf of all employees, William Shea, veteran employee of 62 years' service, received the Navy "E" lapel emblem from Commander Robert S. Smith, Jr., U.S.N.

Shown here with the Navy "E" burgee at the presentation ceremonies on May 10, are, left to right: A. G. Kessler; Captain L. F. Small; Karr Parker, President of Buffalo Chamber of Commerce and chairman of the presentation ceremonies; C. Wayland Brooks United States Senator from Illinois, principal speaker of the occasion; Commander Robert S. Smith, Jr.; Lieutenant Commander William J. Connors; Captain Frederick L. Oliver Inspector of Naval Material, Pittsburgh district; William Shea and Rear Admiral Henry A. Wiley.

The Jeffrey Mfg. Co. Cited by Navy

During an impressive ceremony, Tuesday evening, May 12th, employees of The Jeffrey Manufacturing Co., Columbus, Ohio, were presented with the highly-coveted Navy "E" pennant and individual insignias for excellence in war production . . work well done.

Captain Robert Henderson, U.S.N. (Ret) made the presentation speech for the Navy and Robert W. Gillispie, President of Jeffrey accepted the Navy "E" burgee for the company. Commander G. H. Bowman, U.S.N. (Ret) made the symbolic presentation of the insignia to O. R. Ehret, oldest Jeffrey employee with 63 years service.

The program lasted 30 minutes and was broadcast over one of the local stations.

Huntington Works of International Nickel Awarded All-Navy "E"

The Huntington (West Virginia) Works of The International Nickel Co., Inc., has been awarded the All-Navy "E" for excellence in the production of ordnance and other material for the United States Navy. This is the second time the plant has been honored by the Navy Department, the Navy Ordnance "E" and Ordnance flag having flow on its flag pole since last August.

The new award was presented to the plant by high-ranking naval officers on Wednesday, June 10, at ceremonies to be witnessed by workers and their families.

The All-Navy "E" award takes the place of the Ordnance "E" given the plant last summer, when it was one of a group of fourteen plants first to gain this Navy award. It is awarded for an additional six months, and the "E" burgee unfurled at the plant on June 10 will carry a white star to indicate this fact.

Plant officials were informed by the Navy Department that the Huntington Works is the only operation in the entire Fifth Naval District, covering West Virginia and neighboring States, to have been honored with both the old and the new "E" award to date. Figures from the Navy Public Relations Bureau indicate that only 173 of the old and new "E" awards have been made up to the present.

Navy "E" Awarded American Blower Corporation

American Blower Corp., 6000 Russell St., Detroit, Mich., pioneer in the development and manufacture of Fluid Drives (Hydraulic Couplings) in America, received official recognition of its contribution to the war effort, May 14, when Rear Admiral John Downes, U.S.N., Commandant, Ninth Naval District, presented the Navy "E" Burgee awarded by the Navy Department for outstanding performance in the production of Fluid Drives and other naval material.

Employees of Tireman Avenue and Russell Street Plants, and their families, witnessed formal presentation of "E" insignia by Commander Robert Velz, U.S.N., Inspector of Naval Material, Detroit. Charles Goetsch and Christopher Kirn, oldest employees in point of service, accepted the insignia in behalf of their fellow workers.

Award of the coveted Navy "E" to American Blower climaxes more than a decade of pioneering in the development and application of the Fluid Drives in this country. The company, in its Russell Street Plant, began manufacture of Fluid Drives for marine use in 1932. Subsequent improvements in design and manufacturing methods have made it possible to utilize the Fluid Drives in many widely varied ways.

American Blower, for many months, has been on an "all-out for Victory" schedule, producing not only Fluid Drives and other special equipment for the U.S. Navy, but Industrial Blowers, Forced Draft Fans, and various other types of Air Handling Equipment for war work in factories of the Defense Plant Corporation, the U. S. Army Air Corps, the Ordnance Department and the U. S. Maritime Commission.

The Color Guard of the Naval Training School, Detroit, and the Navy Service School Band participated in the ceremonies. S. L. A. Marshall, news analyst and commentator, was chairman.

Navy Again Honors Bantam Bearings for War Work

South Bend, Ind. For the second time in six months the Navy has expressed appreciation to employees and management of the Bantam Bearings Corp. for an outstanding production record on work being done for the Navy by awarding the Corporation the coveted "E" for excellence pennant with white star and fouled anchor, symbolic of an outstanding production record since the firm received an "E" pennant six months ago.

Lieut. Kenneth Keepers and Ensign E. C. Dollard presented the award as representatives of the ninth naval district.

South Bend Tribune Photo

Illustration shows R. B. Nichols, Vice President and General Manager of Bantam Bearings Corp., South Bend, Indiana, accepting on behalf of Bantam employees second Navy "E" award given the company in six months for an outstanding record of production for the Nation's war program. Presenting the award are Lieut. Kenneth Keepers (center) and Ensign E. C. Dollard, representing the Navy Department.

In accepting the award on behalf of the Bantam Bearings organization, R. B. Nichols, Vice President and General Manager of the Corporation said, "This citation from the Navy Department is further evidence that our employees are keeping their promise to

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go all out for the war effort. Since the first "E" award was made we have been able to step up production in a marked degree, and I'm sure every man is ready to try again to better our record."

An additional white star can be added every six months that the company maintains its splendid production record. The Bantam Bearings Corp. was among the first to receive the original Navy "E" award and is one of four in the midwest to receive the additional star and fouled anchor pennant.

Navy "E" Awarded to De Laval Steam Turbine Co.

In a letter announcing the award of the Navy "E" to the De Laval Steam Turbine Co., Trenton, New Jersey, Secretary of the Navy, Knox congratulates the workers and management upon their significant contribution in industrial production toward winning the war. During the first World War and subsequently the De Laval Company took a leading position by reason of both the quantity and the excellence of its output of geared turbine propelling equipment and pumps; and since the beginning of re-armament its activity has been increased to the utmost, the total of orders now running into many millions of horsepower. The plant will be authorized to fly the Navy "E" pennant and employees will be privileged to wear the Navy "E" lapel insignia after the formal presentation ceremonies.

Navy Again Recognizes Production Achievement of Carrier Corporation

For outstanding production achievement, Carrier Corp., Syracuse, N. Y., today is authorized by the Navy Department to fly the Navy "E" pennant, won last year, for another six months' period.

The Navy's new "E" pennant, with one star added for the additional six months of production, was presented to Carrier employees and officials by Lt. Thomas W. Dewart, of the Headquarters of the Third Naval District, New York City.

Only a simple ceremony was held, attended by some 75 representatives of Carrier, because of the stoppage of production involved in bringing all employees together. Each employee will be advised personally, however, that he has helped to keep for Carrier the Navy "E" by helping America win the "Battle of Production."

Receiving the new burgee, or pennant, for Carrier were Cloud Wampler, executive vice president; Edward C. Weaver, president of the Carrier Employees Association, and Stanley Pendray, representative of the War Production Drive Committee.

In presenting the starred burgee, Lt. Dewart made a plea for renewed production effort. "You have done well," he stated, "well enough to win one Navy 'E'—well enough to win a star for that 'E'—but that is not enough—not nearly enough. Just before leaving New York to come up and present you with your new 'E' banner, I talked with Lt. John Bulkeley, Lt. Kelly and Ensign Akers of PT boat fame, who were in the Philippines only 25 days ago. If you could have had the privilege of talking to these men, you would realize the need for greater production.

"Already in this war, your Navy afloat has lost more men and ships than in the World War and the Spanish War combined.

"The answer to all this lies right here on the production line. You can stop it. You have got to stop it. The sooner we out-produce the enemy in ships, tanks, guns, bombs, and planes, the sooner our boys will be coming back to live and enjoy the fine homes and the luxuries that you people enjoy here in

Continued on Page 30

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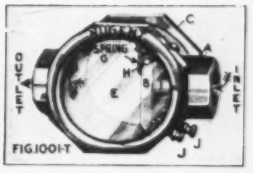
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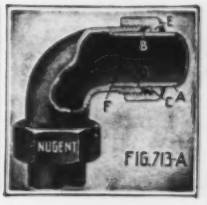
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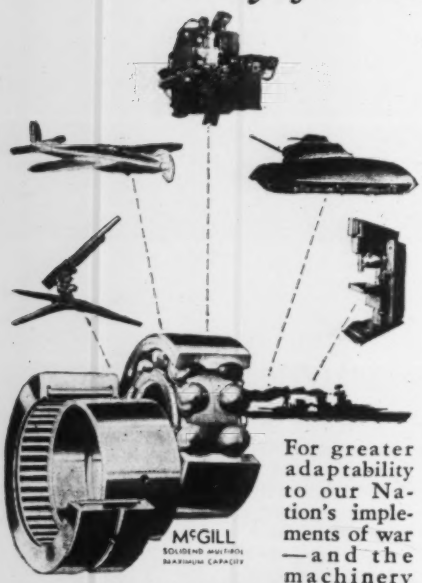

For greater adaptability to our Nation's implements of war—and the machinery necessary in their production—the size range of McGILL "Solidend" *MULTIROL* Bearings has been increased to accommodate shaft sizes up to 9¼".

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To the machine designer, photoelastic stress analysis is not only of value in the verification of calculations based on theoretical solutions, but also in the solution of problems where theoretical analysis is not available. Where weight and space must be conserved actual stress distribution is more important than stress indicated by theoretical analysis.

In the new model polariscopes of 4¼" and 6¼" clear aperture, the parallel beam is collected by a rear element and condensed through a three component lens of the Cooke system. In the new larger units (8¼" and 10" aperture) a four component lens of the Omnar system is used. In both cases, *the image is sharp throughout the field, free of aberration, astigmatism and distortion.*

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America. We have had those things—now we must fight for them. We must fight for more than that. We must fight for the freedom that these boys are dying to preserve, and you know it's worth it.

"Remember every minute of the day, the first fifteen minutes of your shift and the last fifteen minutes of your shift and every minute in between, that while you are working here, in the Navy ashore, men are fighting and dying in the Navy afloat. Don't Let Them Down."

One of the first 25 companies in the nation to be singled out for naval production honors, Carrier was first awarded the "E" last September by the Bureau of Ordnance.

Later, the Navy Board for Production Awards was created under the chairmanship of Rear Admiral H. A. Wiley, retired, and the other production bureaus of the Navy joined with the Ordnance in the awards plan.

Supplanting the Bureau of Ordnance pennant, first used and flown by Carrier, a swallow-tailed pennant bearing the "E" symbol and the Navy's "fouled anchor" is now used as the official emblem and was handed to Carrier by Lieut. Dewart.

In advising Carrier that its award had been extended for continuing outstanding production, Admiral Wiley said: "With the hearty concurrence of the Bureau of Ordnance, it is my privilege to advise you that the Board of Production Awards approves your hoisting the All-Navy 'E' burgee at any of the establishments of your company now entitled to fly the Bureau of Ordnance flag."

Chemical Proportioner

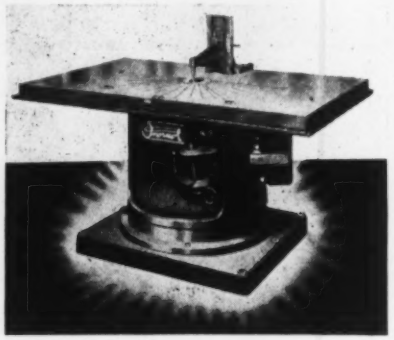
Graver Chemical Proportioner—A new device providing accurate control of the feed of chemicals into the water treating plant in proportion to the volume of water.

Equipment insures uniform treatment at all times regardless of volume of water entering treating plant. Permits instant increase or reduction of chemical charge over a wide range should water require change of treatment.

Proportioner is readily adapted to any make of solution type chemical feeder where swing pipe or skimmer can be installed in chemical feeder.

Write for bulletin 310 describing this equipment. Graver Tank & Mfg. Co., Inc., 4809–27 Tod Ave., East Chicago, Indiana.

For Machining Constant or Varying Bevels



New to the metal working field is the Onsrud A-69 Tilting Spindle Shaper, especially built for the heretofore difficult job of cutting a bevel of varying angle. After approximately ten months of comprehensive test applications in selected metal working plants throughout the country, the A-69 has proved itself the machine tool answer for such typical tasks as cutting constant or varying bevels on the form blocks used in hydraulic press work. The variety of work performed during the test period on machinable nonferrous metals and their alloys, plastics, wood, and composition materials such as Masonite Die Stock, demonstrated that this versatile machine is at home in the tool room or pattern shop as well as on the production line.

For production work, closed or open angles up to 20° may be quickly machined simply by tilting the spindle and attached cutter at the particular angle desired. A fence or similar fixture is used as a guide and the work can be fed past the cutter by hand. Accuracy is easy to maintain and the job of changing the cutter angle requires nothing more than a readjustment of a hand wheel and lock.

However, the maximum and outstanding abilities of the Tilting Spindle Shaper are not realized until the machine is put to work in the tool room or pattern shop. On the table are graduation marks, and because of these marks it is possible to employ a fundamentally new type of feed, that makes a fast moving, simple machine tool job out of the formerly slow and troublesome one of cutting varying bevels on a piece of work. This feed is termed "sweep" feed and by it any desired series of angles may be machined in one set-up and one pass up to the limit determined by the angle at which the spindle itself is set.

Sweep feed is easy to understand when you bear in mind that the bevel or plane machined on work results not only from the angle at which the cutter is tilted, but also from the direction at which the work is fed across the cutter. The cutter can be tilted only toward the front or the back of the machine. Passed across the cutter from front to back of the machine, the work will always have a vertical plane machined on it, regardless of the angle at which the cutter is set. Passed across the cutter from one side of the machine to the other, the work will be beveled at the angle at which the cutter is set or tilted. Passed across the cutter on a line between these two extremes, a plane will be beveled on the work at an angle between perpendicular and the angle at which the spindle is tilted.

Since the spindle can be set at a particular angle and the graduated table surface is a visual guide for feeding the work in a particular direction in relation to the cutter, it is easy to obtain a required bevel. As the direction of feed is changed, the bevel being machined is also changed, and in this way sweep feed results in a varying bevel. The angles that will result from the many combinations of tilted spindle and direction of feed have been tabulated . . . and from this an operator can obtain with ease, speed, and accuracy, whatever constant or varying bevel is necessary.

When sweep feed is employed, a pattern is fastened to the work to be beveled and the pattern is fed against an overhead guide pin so that the horizontal shape of the finished work will be properly outlined.

The Onsrud A-69 Tilting Spindle Shaper, like all Onsrud machine tools, has a high speed cutter. A high cycle motor directly drives the cutter at 10,800 RPM. This motor is lubricated by the Onsrud patent Metered Mist system, especially designed for high RPM bearing lubrication—a system built into all Onsrud machine tools, that has proved itself during the past three years by millions of machine hours of successful operation.

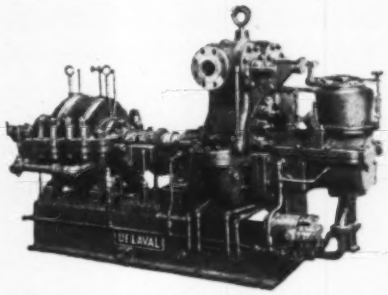
A coolant system is built into the machine to be operated when work requires. Both small and large work may be machined on the A-69. Standard table size is 72" long x

44" wide. Table extensions are available to give a total table length of 12'.

The manufacturer, Onsrud Machine Works, Inc., 2218 North Springfield Ave., Chicago, Ill., will be happy to supply detailed information upon written request from company officials and shop superintendents—although delivery of machines can naturally be made only to those supplying suitable priorities.

DeLaval Velocity-Stage Turbines

The improved De Laval Velocity-Stage Turbines made by DeLaval Steam Turbine Co., Trenton, N. J., have been designed to meet modern conditions of steam pressure and temperature. Where used for driving auxiliaries, such as pumps and fans, they can in most plants be connected directly to the superheated steam main. The efficiency is as high as is attainable with a single pressure-stage and where the exhaust steam is utilized for heating and process purposes high overall economy is had.



Steam expands from the initial to the final pressure in a single set of nozzles. The latter are made of stainless steel, accurately machined and reamed. They are screwed and welded into drop-forged steel bodies supported by the steam chest wall. Hand valves for individual nozzles can be fitted to make possible high efficiency under varying load or steam conditions. The steam is directed onto a first row of stainless steel buckets, which are individually fastened to the wheel. From these buckets it enters between stationary stainless steel guide vanes integral with and supported by the nozzles, which redirect it onto a second row of moving buckets, also of stainless steel. The buckets have large radial and axial clearances.

The casing cover combines in one casting the steam chest and the speed-governor and emergency shut-off valve bodies. These parts, and the nozzles, are the only parts of the turbine coming into contact with steam at the initial pressure and temperature and, where the pressure and temperature of the steam are high, they are made of cast steel. The lower half of the casing is also made of cast steel where required by high temperature exhaust conditions. The cover and attached parts are easily lifted to expose the wheel. There are no packed joints or crossover connections to the lower half of the casing. Parts subject to the highest temperatures are remote from and above the shaft and bearings, resulting in lower temperatures of bearings and oil. For moderate steam temperatures the babbitt-lined bearings are lubricated by rings which carry up oil from reservoirs, but where the temperature of the steam at inlet or at exhaust is excessive, water-cooling or forced-feed lubrication can be provided. Also, an oil pump is provided for forced-feed lubrication in high-speed turbines. The cast iron bearing shells are accurately machined and ground to fit seats accurately scraped to limit gages. A ball thrust bearing locates the rotor axially.

The wheel is machined from a steel forging and is proportioned to withstand rotating speeds far in excess of normal. It is held by key and lock nut upon a shaft of liberal size. Steam or air leakage is prevented by packings on the shaft at each side of the casing. Each packing box contains four carbon rings, with an intervening space for steam-sealing or bleed-off.

The turbine has a centrifugal speed governor and an independent emergency tripping device consisting of an eccentrically loaded, pivoted ring which, at a predetermined speed, releases the independent emergency shut-off valve, which has a stainless steel stem. The valve can also be tripped and reset by hand.

The powerful and sensitive speed-regulating governor, consisting of fly-weights pivoted upon rockers, is either mounted on the turbine shaft or, depending upon operating conditions, on a vertical shaft driven through a worm and worm wheel. The governing action is transmitted to the regulating valve through a ball thrust bearing and a lever mounted on a needle bearing. By adjusting a spring the speed can be changed while the turbine is running. Hydraulic governors also are used, particularly where the speed of the turbine is to be regulated to control the pressure or the rate of flow set up by a pump, a blower, or a compressor. The regulating valve is of the balanced, seating type and is actuated through a stainless steel stem packed with pure asbestos rings. The emergency closing and governor regulating valves are preceded by an accessible and removable steam strainer, consisting of a heavy, monel-metal screen.

The parts for these turbines are manufactured in quantities, using special jigs, gages and fixtures, and are inspected by means of limit gages to insure interchangeability and to eliminate hand-fitting. Each part is marked with symbols to certify inspection and for identification when ordering a duplicate part. After assembly a running test is made of each unit to insure satisfactory mechanical operation.

• BUSINESS CHANGES

Haering Continues Growth in 1942

The rapid rise of the D. W. Haering Organization from one man in 1931 to a national organization in 1942 playing a vital and substantial part in the industrial war effort is emphasized by the recent addition of several thousand feet of floor space to the Haering General Offices on the eighteenth floor of the Engineering Building in Chicago.

Recent personnel additions to keep pace with Haering's increasing requirements include the appointment of Arthur J. Grotsma, Controller, and Robert Seyl, well known electrochemist and chemical engineer, Director of Service. Ilya Stephanoff, Mitchell Stanislaus Sniegowski, and Isabelle Luan, chemists, have also been added to the Haering Laboratory Staff.

Jack Daggett, chemist, has been transferred from the laboratory to the field engineering department and John J. Meacher, field engineer in Cincinnati has been pro-

Continued on Page 32

IF YOU NEED A Lubricant of Increased Load Carrying Capacity

USE "STURACO" ★★★★ EXTREME PRESSURE ("EP")

MACHINERY OILS & GREASES

• Here is the answer to many of your lubrication problems caused by today's production demand of heavy loads, high speeds, and continuous operation of machinery and machine tools. "Sturaco" EP Oils and Greases, without any change in your accustomed viscosity or consistency, offer a minimum of 300% increased load carrying capacity with notable low torque.

Lubrication of ways — spindle bearings — gear heads — elevating screws — speed reducers — are typical examples where "Sturaco" application has solved tough lubrication problems. If you need help, write or phone today.

• • •

SEND FOR the new "Sturaco" booklet outlining laboratory research behind this genuine development, describing typical applications and listing various grades.

For All Cutting Fluid Problems
D. A. STUART OIL CO.
Chicago, U.S.A. • LIMITED • Est. 1865
Warehouses in All Principal Metal Working Centers

A PAIR OF IRON BODY VALVES FOR CONTINUOUS SERVICE

Fig. 1640 I.B.B.M. "King-clip" Gate

Fig. 1644 All-Iron "King-clip" Gate

On lines where uninterrupted service is essential . . . which means *all lines* in these critical times . . . you'll do well to use these two Lunkenheimer iron body gate valves.

They are built to stand up under rough, hard usage . . . to stay tight and to give the added long service life so necessary now when replacement time is so important.

You can use them to advantage in the many places where small gate valves are used. Fig. 1640 has wide application on steam, oil, gas, water and gasoline lines and Fig. 1644 on many corrosive lines.

Once installed, these quality valves will do their part well.

●

Since virtually all materials used in the manufacture of valves are on the list of critical materials, valve users are urged to furnish the highest possible preference ratings on their orders. This will be of mutual helpfulness.

ESTABLISHED 1862
THE LUNKENHEIMER CO.
"QUALITY"
CINCINNATI, OHIO, U. S. A.
NEW YORK CHICAGO
BOSTON PHILADELPHIA
EXPORT DEPT. 318-322 HUDSON ST., NEW YORK

LUNKENHEIMER VALVES

• Keep Informed

moted to District Manager of the new Cincinnati District Offices.

D. W. Harrington has been placed in charge of the Philadelphia Offices at 1200 Commercial Trust Building with A. J. Levington and John C. McKeon operating under his direction. Dr. Leonard Elion has been added to the New York Field staff and William Wagner has been placed in field service in Boston, Mass.

John Banks has been placed in charge of the Pittsburgh office at Suite 207 Investment Building, 239—4th Avenue, and Brad Fogarty has been placed in the Central Pennsylvania field operating from 211 E. First St., Bloomsburg, Pa. Guy Hudson has been placed in the Arkansas River Valley and Texas Panhandle areas operating from Wylie, Colorado; John P. Warble has been added to the Chicago field staff and Lewis C. Hills has been placed in the Indianapolis Territory.

J. C. Dickinson has been assigned to field work in Jacksonville, Florida and John D. Noyes has been assigned to field engineering in the Miami, Florida area.

Foxboro Company Employees Observe 25-Year Milestone

Employees of The Foxboro Co who have completed 25 years or more in its service were guests of the Company at a celebration, held at the Main Office, Foxboro, Mass., on the evening of May 26th. A jeweled service pin of gold was presented to each of the 50 men and women thus honored, and a program of entertainment, supplemented by the reminiscences of old-timers, made the occasion an enjoyable one.

Almost another 50 employees have service records which are within a few months of the quarter-century mark; and it is therefore assured that similar celebrations will be held annually, hereafter, to welcome new members as they qualify.

The Foxboro Co., 182 Neponset Ave., Foxboro, Mass., makers of instruments for process measurement and control, was organized in 1908 as the Industrial Instrument Company, but adopted its present name in 1912. The Company maintains 28 district offices in the United States and branch factories at Pittsburgh, Dallas and San Francisco, and has complete factories in Montreal and in London, England, and representatives in all parts of the world.

General Electric Aviation Division Appointments

Edward G. Haven has been appointed manager sales of the aviation division of General Electric's industrial department and David R. Shoults has been named engineer of the same division, according to announcements by J. E. N. Hume, G-E commercial vice president, and J. D. Wright, manager of the industrial engineering department.

Mr. Haven was born in Wellsville, N. Y He entered the employ of the General Electric Co. as a student engineer in 1922 after being graduated from Union College with the degree of B.S. in electrical engineering. In 1923 he joined the Adirondack Power & Light Co., returning to General Electric in 1929 as a member of the company's marine and aircraft engineering department.

In 1932 Mr. Haven transferred to the industrial engineering department, and in 1936 joined the aviation division where his work has covered engineering and sales activities of this division.

In the first World War, Mr. Haven was a second lieutenant in the Army Air Corps. He has actively participated in commercial and private flying since that time.

Mr. Shoults is a native of Storms, Ohio.

• Keep Informed . . .

After being graduated from the University of Idaho in 1925 with a B.S. degree, he joined General Electric as a student engineer, and worked in several G-E plants. He has been with G-E's industrial engineering department since 1928. For several months in 1941, Mr. Shoults was in England doing special war work.

Johnson Made Manager of Allis-Chalmers General Sales Organization

Walter Geist, president of the Allis-Chalmers Mfg. Co., announced that William C. Johnson, sales manager of the crushing and cement division, has been named manager of the Allis-Chalmers general sales organization.

Until his election as president, Mr. Geist directed the general sales organization first as general representative and later as vice president.

As general sales manager, Mr. Johnson will direct the sales of 1,600 different products and the operations of 60 district offices.

When Mr. Johnson arrived in Milwaukee from Alabama to join the Allis-Chalmers organization in January 1924, he found that there was a misunderstanding—that his application had been accepted as that of a graduate engineer for the company's training course. He explained that he had gone to work after graduating from high school in his native city, Birmingham, Ala., and that he since had fired a switch engine, worked for utilities, and had first become acquainted with Allis-Chalmers equipment while acting in a clerical capacity on a hydro-electric installation. After clarifying the misunderstanding, he put on his overalls and started to work as a helper on a layout table in the shop. He also spent a short time in the foundry, and then went on an erection job at the Riverside Pumping station, Milwaukee.

Back in the shops again after the completion of the pumping station, he went to work on crushing machinery.

He became an expert on new crushing equipment then in the process of development and was sent all over the country to service the equipment. In that capacity he became widely acquainted with the industry.

In 1929 he was made the representative of the crushing and cement division in the Atlanta, Ga., district, which included seven southeastern states. In 1935 he went to Chattanooga, Tenn., in a general sales capacity, and two years later he opened up a company district office at Knoxville, Tenn., where he handled contracts with the Tennessee Valley Authority, the aluminum and phosphate industries. He also went out of the country several times to conduct important sales negotitations.

In March, 1940, he returned to Milwaukee as sales manager for the crushing and cement division.

• LATEST CATALOGS

New Monel Technical Bulletin

The International Nickel Company, 67 Wall St., New York, N. Y. announce a Revised Edition of Machining Monel, "R" Monel, Inconel, "K" Monel, "KR" Monel and Nickel—Technical Bulletin T-12.

Data on mechanical properties of "KR" Monel have been added and those on the various other materials brought up to date. The oversize allowances required to obtain a clean machined finished surface have also been revised.

The bulletin includes additional appropriate discussion of "R" Monel and "KR" Monel, together with recommended cutting feeds and speeds for "KR" Monel based on machining practice.

Band sawing is discussed. Also added are data on results of drilling tests on cast materials, conducted by the National Twist Drill Company, and of tests by the Norton Company on precision grinding.

On Bottling Department Water Problems

"We Read Water in the Bottling Department" is the title of a new pamphlet on bottling water problems published by the D. W. Haering & Co., Inc., water consultants in Chicago.

Scale and corrosion in bottle washers and pasteurizers and algae, slimes and odors occurring in pasteurizer operation are discussed with methods of control. Protection of conveyors and chain drives are also phases of water control in such equipment.

This new Haering Booklet provides a concise discussion of bottling department water problems covering essential considerations in a few words and contains information of interest to every bottling shop chemist or foreman.

Copies of this folder on bottling water scale and corrosion control may be obtained without charge or obligation by addressing requests to D. W. Haering & Co., Inc., 205 W. Wacker Drive, Chicago, Ill.

"Modern Precision"

Leeds & Northrup Co., has just issued a rather distinctive publication of general interest to engineers, research scientists, executives and users of electrical instruments, controls and furnaces.

Called "Modern Precision," it contains news of L&N instruments, controls and heat-

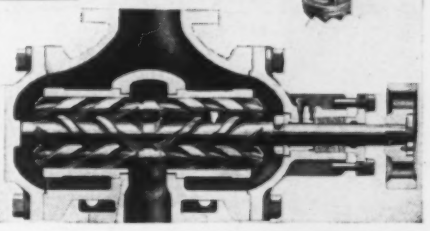
Continued on Page 34

for High Pressure LUBE OIL

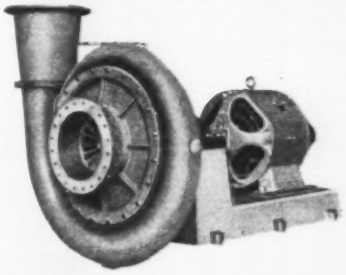
This De Laval-IMO

rotary displacement pump, directly connected to a motor running at 1450 r. p. m., delivers oil against a pressure of 330 lbs. per sq. in. to the lubricating system of the vertical thrust bearing of a large hydraulic turbine. The pump end is submerged in the oil sump. There are no valves, no gears and no pump bearings. The flow is without pulsation, as from a steadily advancing piston. Ask for Catalog I-94.

IMO PUMP DIVISION of the De Laval Steam Turbine Co. Trenton, N. J.



WHEN PRODUCTION hits Peak Plus

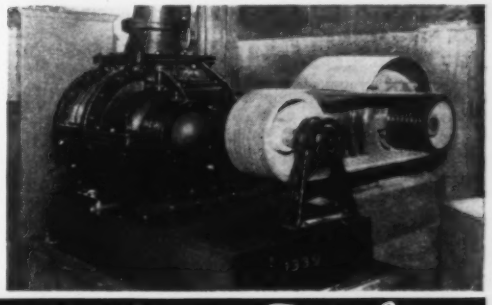


Single stage 20" Centrifugal Blower handling SO_2 gas for western smelting company. 10,500 CFM; 2 lbs. pressure.

You need plus-performance from your air and gas handling equipment. This is the kind of service Roots-Connersville Blowers and Exhausters deliver on the really "tough jobs"—in agitation, flotation, combustion, pneumatic conveying, processing, exhausting, and boosting operations.

Lengthening deliveries, due to war-time demands, should bring consideration now of future needs.

ROOTS-CONNERSVILLE BLOWER CORP.
207 MICHIGAN AVE. CONNERSVILLE, INDIANA



Rotary Positive Blower used for agitation in Canadian gold mine. 1,200 CFM; 10½ lbs. pressure.

All Out for Victory

Roots Connersville Since 1854

Rotary Positive & Centrifugal AIR and GAS HANDLING EQUIPMENT

treating methods, and of the jobs they are doing in industry, in research laboratories and in teaching and testing. An addition to other L&N literature, it supplements the regular catalogs, bulletins and circulars which will continue to be issued as before.

"Modern Precision" has 16 pages, $10^1/_2$ inches by $15^3/_8$ inches. It contains valuable information for a wide variety of industrial, educational and scientific fields. A copy can be had upon request to Leeds & Northrup Co., 4934 Stenton Avenue, Philadelphia, Pa.

New Synchronous Motor Booklet

A new four-page booklet describing the "HG" synchronous motor for coupled belted and geared service, is announced by the Westinghouse Electric & Manufacturing Co.

The booklet lists the operating characteristics of the motor and stresses distinctive features, construction and application. Seven illustrations show the various parts of the motor and each is described in detail.

These "HG" motors are recommended for all types of constant speed machinery such as fans, blowers, compressors, pumps, rubber mill lines, motor generator sets, etc. They afford a very economical means of improving power factor and thereby reducing power cost. These motors are normally furnished for 100 per cent or 80 per cent leading power factor operation, however, they can be designed with lower leading power factors where additional power factor correction is desired.

A copy of leaflet L-20653 may be secured from department 7-N-20, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

Electronic Welding Timer

Sequence and automatic weld timers, which increase weld production and reduce outage time, are described in a new 6-page booklet announced by the Westinghouse Electric & Manufacturing Co.

The illustrated booklet gives application information and special design features. Also diagrams showing complete sequence of operation in pulsation welding and how the electronic timer and other controls fit into the average resistance welding circuit.

The electronic timer is designed for resistance welders using air or hydraulically operated electrodes, with solenoid operated valves. Timing panels are available as either automatic weld timers or sequence timers.

These timers are adaptable for controlling spot, butt and projection welders. Sixteen models conforming with NEMA standards are housed in duplicate standard cabinets. Two tables are given, one for automatic weld timers, and the other for sequence timers. These tables give the NEMA type number, type of welding, operation, timing function, and rating.

A copy of booklet B-3079 may be secured from department 7-N-20, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

DeLaval at Indianapolis

The pumping equipment of the Indianapolis Water Company, which supplies the city of that name, is described in a leaflet distributed by the De Laval Steam Turbine Co., Trenton, N. J. There are five principal pumping stations, in which are installed a total of some 90 De Laval pumps, varying from small capacities up to 40 million gallons per day. A number of engineering problems have been solved by the use of various types of pumping equipment, including geared steam turbine centrifugal pumps, water turbine-driven centrifugal pumps, motor-driven centrifugal pumps and centrifugal pumps for raising water from wells. Copies will be sent upon request.

Compressed Air Pipe Friction

A chart for quickly determining the drop in pressure accompanying the flow of air or gas through pipes of known diameter and length is being distributed by the De Laval Steam Turbine Co., Trenton, N. J. For a given rate of flow through a pipe of given diameter, the chart gives a friction factor, from which the pressure drop is readily calculated by simple multiplication and division, taking into account the temperature, the specific gravity, and the pressure. An auxiliary alignment chart provides for reducing pipes of different diameters to equivalent lengths of a single diameter in order to simplify the calculation for systems containing piping of various diameters.

Two New Sizes of Bulk-Flo Conveyors

A new 32-page illustrated catalog and data Book No. 2075 on the Link-Belt Bulk-Flo elevator-conveyor has been published by Link-Belt Co., Philadelphia, Chicago, San Francisco.

Two new sizes are included, as compared with the catalog that the company issued when it first announced this new bulk conveying system, last June. Power formulae and other engineering data have also been added.

The book contains diagrams showing paths of operation, gives a long list of materials that can be handled, and contains illustrated case studies, with tables of sizes, capacities, dimensions, etc.

Not yet a year ago Bulk-Flo was announced as "a distinctly new and different power-operated conveyor system for the positive and continuous conveying of flowable granular, crushed, ground or pulverized materials of a non-corrosive, non-abrasive nature."

A copy of new Book No. 2075 will be sent to any interested reader upon receipt of request made on business letterhead.

New Handbook on Care of Motors

With motors operating 168 hours a week instead of 40 hours as formerly, most books on motor care are now seriously out-of-date. To correct this situation, Allis-Chalmers, Milwaukee, has just published a new handbook entitled "A Guide to Wartime Care of Electric Motors." Taking a fresh, new slant at the subject of motor care under war conditions, the book is of great value to war plant engineers and maintenance men, and is of particular value for training new men. The book contains no advertising, and is available upon request.

Circle Ess Flexible Shafting

An illustrated book on Circle Ess flexible shafting has been issued by the F. W. Stewart Manufacturing Corp. of Chicago. It is a complete summary showing the many uses for flexible shafting both in power drive and remote control. In the transmitting of power around bends, for accurate alignment of moving parts, flexible shafting offers countless advantages for simple and economical design in all types of equipment.

Photographic reproductions show the application of flexible shafting in airplanes, automobiles, radios, in fact, in almost every type of manufacture. Because of the urgent need of speed and precision for war production, new uses for flexible shafting are being discovered constantly in the manufacture of airplanes, tanks, signal corps units, as well as numerous other equipment for all branches of the army and navy. Circle Ess shaftings are graphically illustrated in complete detail in this book, while over one-hundred illustrations show the shaft end and casing end fittings. If you will write to the F. W. Stewart Manufacturing Corp., 4311 Ravenswood Ave., Chicago, and ask for latest Manual E, they will be glad to send it to you without obligation.

COMING MEETINGS AND CONVENTIONS

SEPTEMBER

7–11 American Chemical Society, Fall Meeting, Hotel Statler, Buffalo, N. Y.

9–11 American Institute of Electrical Engineers, Pacific Coast Convention, Vancouver Hotel, Vancouver, B. C.

22–24 Association of Iron and Steel Engineers, Annual Convention, Hotel William Penn, Pittsburgh, Pa.

28–Oct. 1 Technical Association of Pulp and Paper Industry, Fall Meeting, Hotel Statler, Boston, Mass.

30—Oct. 2 A.I.M.E. Regional Meeting—Joint meeting ASME Fuels Division and AIME Coal Division, Hotel Statler, St. Louis, Mo.

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In ALL BRANCHES of the ENGINEERING FIELD

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ONE Organization to Handle ALL Water Problems.
Consultation and Design
Boiler, Process and Municipal Water. Waste and Sewage Disposal. Analysis and Research.
W. H. & L. D. BETZ
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Power Plants and Electrical Distribution for Industry. Surveys, Reports, Design, Construction, Supervision.
EDWARD R. FEICHT
Bala-Cynwyd, Pa. (outside Philadelphia)

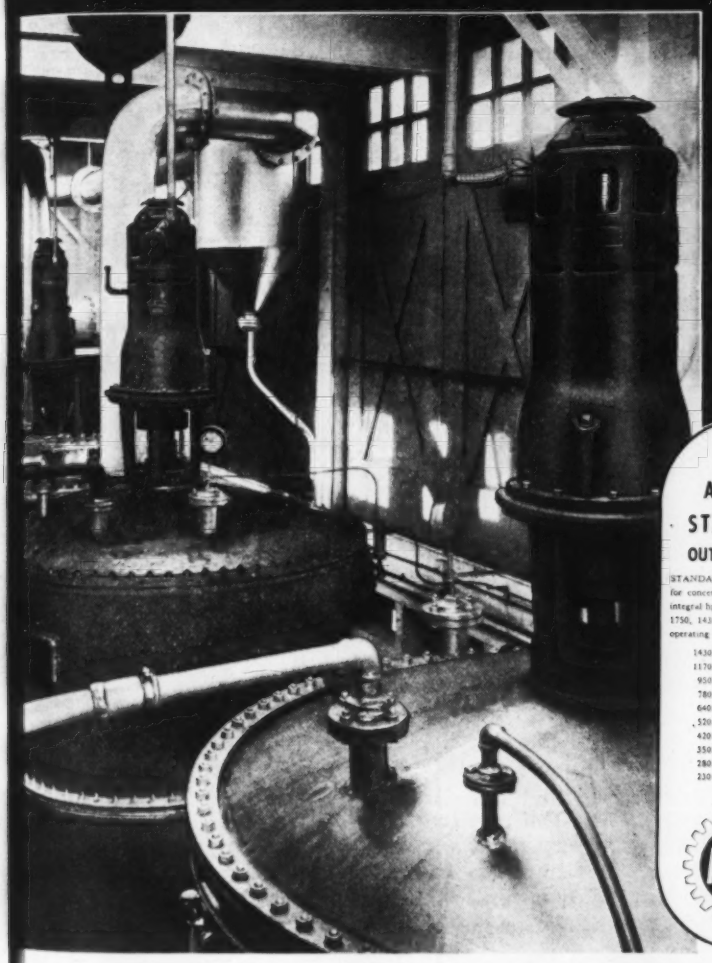
Chemical and Metallographical Laboratories—Welding . . . Supervision, Inspection and Testing, Qualification of Operators and Procedure.
THE JAMES H. HERRON CO., Cleveland, Ohio

Weld Testing—Qualification of Operators—Supervision—Inspection—Research.
NATIONAL WELD TESTING BUREAU
Pittsburgh Testing Laboratory, Pittsburgh, Pa.

Power Plants, Structures Transmission Systems—Design Supervision, Inspection, Appraisals, Reports.
SARGENT & LUNDY
140 S. Dearborn St., Chicago, Ill.

RATE Announcements under this heading in MECHANICAL ENGINEERING are inserted at the flat rate of $1.25 a line per issue, $1.00 a line to A.S.M.E members, minimum charge, three line basis. Uniform style set-up. Copy must be in hand not later than the 10th of the month preceding date of publication.

You did tell them how the MOTOREDUCER *design* simplifies the installation *job*



★
A.G.M.A.
STANDARD
OUTPUT SPEEDS

STANDARD OUTPUT SPEEDS for concentric and parallel shaft integral hp Gearmotors. Based on 1750, 1430 or 1165 rpm motor operating speeds.

1430	190	25
1170	155	20
950	125	16.5
780	100	13.5
640	84	11.0
520	68	9.0
420	56	7.5
350	45	6.0
280	37	5.0
230	30	4.0

AGMA

The MotoReduceR, in both the horizontal and vertical types, has been designed as a complete straight-line unit with motor and reduction gears in a single, compact housing. The extra coupling, base-plate and all other unnecessary parts have been eliminated. This unitized construction saves considerable time and effort in installing and enables it to fit in places where other types of drives would be impractical. This design, however, in no way interferes with the accessibility of the various parts. Get our catalog that explains the many other advantages of the Philadelphia MotoReduceR. It's yours for the asking.

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INDUSTRIAL GEARS
AND SPEED REDUCERS
LIMITORQUE VALVE CONTROLS

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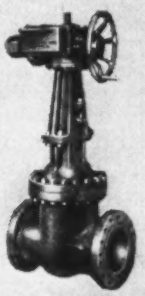
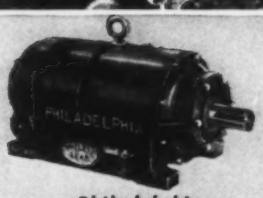
PHILADELPHIA, PA.
New York, Pittsburgh, Chicago



Philadelphia
LIMITORQUE CONTROL
operates all types of valves, etc., safely, economically, from convenient stations.

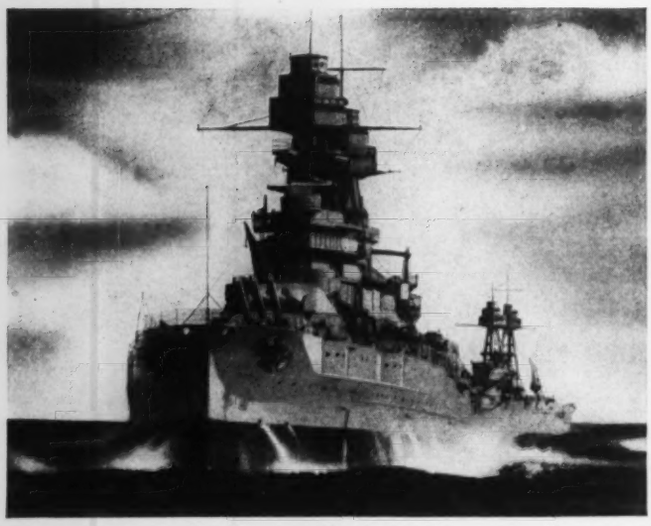
Philadelphia
GEARS
All types and sizes of industrial gears. Can be supplied in all materials.

Philadelphia
WORM GEAR SPEED REDUCER
right angle drives — vertical or horizontal. Wide range of ratios and horsepowers.



Philadelphia
MOTOREDUCER
The economical self-contained drive, Horizontal or Vertical types — various ratios and horsepowers.

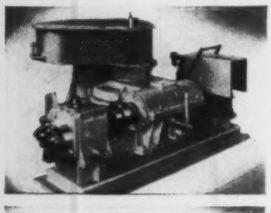
Philadelphia
HERRINGBONE SPEED REDUCER
for heavy loads at high speed. Single, Double, Triple Reductions, various ratios and horsepowers.

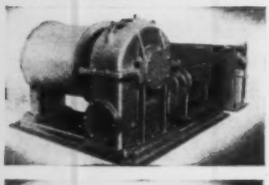


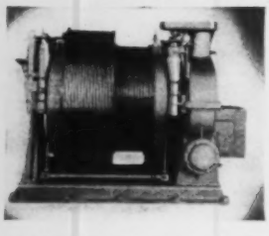
CLEVELANDS
with the United States Navy

During its 30 years, Cleveland not only has become the largest producer of Worm Gearing, but has gained wide appreciation for its Engineering resourcefulness in making successful installations on unusual jobs throughout all major Industries.

From this continual, long-range development have come Standard Types in ample ranges of capacities and ratios which meet nearly all specifications; and Worm Gearing of special design for those which do not.







Through years of diversified experience doing a single job successfully, we are honored to serve the United States Navy through the contractors who supply Cleveland-operated Deck Machinery. The Units illustrated here are typical.

The Cleveland Worm & Gear Company, 3264 East 80th St., Cleveland, Ohio.

Affiliate: The Farval Corporation, Cleveland, Manufacturers of Centralized Systems of Lubrication

In Canada: PEACOCK BROTHERS LIMITED

CLEVELAND WORM GEAR
Speed Reducers

The Standards COLUMN

News of Interest to Manufacturers

Proposed American Standard for Letter Symbols for Heat and Thermodynamics

Sectional Committee Z10 on the Standardization of Letter Symbols and Abbreviations for Science and Engineering, Z10, is now voting on a proposed American standard for heat and thermodynamics.

This standard consists of an extensive revision of the present American Tentative Standard for Symbols for Heat and Thermodynamics approved and published in February, 1931. The initial draft of this revision was prepared by a subcommittee of Sectional Committee Z10 appointed in April, 1926.

This committee was organized under the procedure of the ASA in January, 1926, with the A.A.A.S., A.S.C.E., A.I.E.E., S.P.E.E., and A.S.M.E. as joint sponsors. It was reorganized in October, 1935, and now consists of representatives of thirty-six national societies, associations, and governmental departments.

The early work on this project dates back to the spring of 1926 when preparations were in progress for a meeting of the Advisory Committee on Symbols of the International Electrotechnical Commission to be held in May, 1926, at New York. Two years later a revised and extended list of letter symbols for heat and thermodynamics was presented by the American delegates for informal discussion at a meeting of a Subcommittee of the IEC Advisory Committee on Steam Turbines held at The Hague in May, 1928. A very large proportion of the symbols in this list was tentatively adopted by the IEC Subcommittee.

The convening of the Third World Power Conference in the United States in September, 1936, and the consequent presence in this country of many prominent scientists and engineers from abroad offered an excellent opportunity for an informal international conference on the standardization of letter symbols for heat and thermodynamics. In the belief that such a conference would make effective progress toward the establishment of international agreement in this field the sponsors addressed invitations to forty-nine organizations in Europe and the United States to name delegates to such a conference. Forty-one delegates representing twenty-nine organizations attended the conference.

During the year 1931 the list of symbols for heat and thermodynamics proposed by the IEC Advisory Committee No. 5 on Steam Turbines was published by the International Electrotechnical Commission in its Publication No. 46 on Steam Turbines, Part 2. Two years later the Deutscher Normenausschuss completed and published its list of symbols and this was followed in 1934 by the British Standard for Engineering Symbols and Abbreviations on this subject. These lists of letter symbols together with the present American Standard formed the basis of this first revision.

For further information—Address

The American Society of Mechanical Engineers
29 West 39th St., New York, N. Y.

• Keep Informed . . .

Announcements in this section are supplied by current advertisers in MECHANICAL ENGINEERING and A.S.M.E. MECHANICAL CATALOG. This section is restricted to these advertisers.

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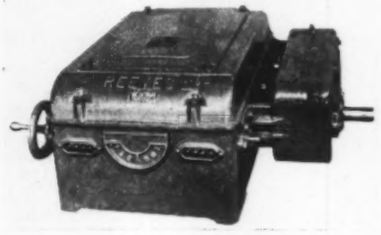
- *BUSINESS CHANGES*
- *LATEST CATALOGS*

Available literature may be secured by addressing a request to the Advertising Department of MECHANICAL ENGINEERING or by writing direct to the manufacturer and mentioning MECHANICAL ENGINEERING as a source.

• NEW EQUIPMENT

Reeves Variable Speed Transmission With Built-In Chain Drive Reducer



Reeves Pulley Company, Columbus, Indiana, now offers a Special Design of the Reeves Variable Speed Transmission, enclosed design, equipped with built-in chain reducer, and with the output shaft in exact alignment with the input shaft.

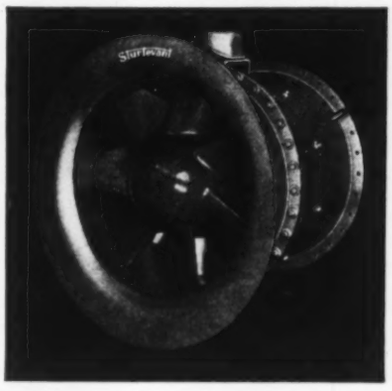
Output speeds may be either increased or decreased as compared to the variable speed shaft of the Transmission, and of course infinitely variable, within predetermined limits, by turning the speed control handwheel.

The chain drive operates in a bath of oil.

The unit illustrated was designed for vertical operation with oil drain and filler located accordingly.

New Axial-Flow Fan With 90% Mechanical Efficiency

A radical innovation in axial-flow fan design has recently been announced by B. F. Sturtevant Co., Hyde Park, Boston, Mass. This new fan, which bears the name "Victory Axiflo Fan" possesses outstanding features in performance, quiet operation and savings in weight, space and power which have never before been approached in fans of the axial-flow type.



For the duration of the war the use of the Victory Axiflo Fan must be restricted to the U. S. Navy, where it is now being used for heating, ventilating and mechanical draft service on Battleships, Cruisers, Destroyers, and Airplane Carriers. At the conclusion of the emergency, it will be available to industry. Because of the great advantages which the new fan possesses for practically every type of ventilating, air-conditioning, mechanical draft and industrial application, the manufacturers anticipate that demands will be extreme when the need for rigid operating economies returns with the revival of competition at the conclusion of the war. Already the makers are preparing to meet these demands.

Among the outstanding features of this new fan are: (1) Mechanical efficiency over 90%. (2) Extremely quiet operation (example: a given unit produces only 80 decibels when supplying 12,000 cfm. at 3″ S.P.). (3) Comparatively small size, light weight, compact (weighs only about 60% as much as other fans for comparable service). (4) Pressures range from $\frac{1}{2}$″ to 6″ wg. for the motor-driven ventilating fan (illustrated above); other designs with turbine drive operate against pressures as high as 60″ wg. (5) High rotative speeds (motor-driven units adapted to 1160 and 1750 standard speed motors; turbine-driven units operate at speeds as high as 5,000 rpm). (6) Extremely wide ranges of sizes and volumes.

Bulletin No. 460, illustrating various designs and construction details will be sent by B. F. Sturtevant Co. on request.

Foxboro Offers Hyper-Reset for Fast Stabilizing Control

A new development of unusual importance in the field of control engineering has been announced by The Foxboro Co., under the name of Hyper-Reset. This is not an instrument or a mechanism, but a control function, available in the newly-designed Model 30 Stabilog Controller, for application where process-lag is considerable. Its importance is demonstrated by tests in which Hyper-Reset consistently re-established process stabilization, following an upset, in one-quarter of the time, and with only one-half the upset effect, as compared with a similar controller having only the usual reset.

Hyper-Reset reduces the effects of a process disturbance by making initial temporary additional corrections, which are proportional to the rates of change of the measured value caused by the disturbance. The normal reset follows, establishing stabilization. But the several control functions carried out by Hyper-Reset are simultaneously and automatically adjusted. No tuning-in is necessary. No more than two process adjustments are required, proportional and Hyper-Reset.

The theory and performance of Hyper-Reset are fully explained in an attractive Bulletin, No. A-330, just issued. Copies will be sent on request. Address The Foxboro Co., 182 Neponset St., Foxboro, Mass.

New 25-Ton Standard Speed Screw Jack

Templeton, Kenly & Co., 1020 S. Central Ave., Chicago, makers of Simplex Jacks, announce the addition of a 25-ton standard speed, bevel gear, ball bearing screw jack, No. 7300.

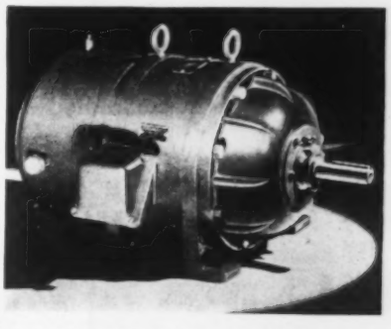
Designed for heavy duty lifting, lowering and skidding work, the manufacturer states that the safe mechanical action, screw adjustment and enclosed ratchet mechanism combined with both toe and cap lift make it an ideal jack for all heavy industrial work.

Toe lift is a minimum of 11″ from base, but jacks can be made with toe in any position to suit user's requirements, and the base design can be modified. No. 7300 is guaranteed to lift its full rated capacity of 25 tons on cap and $12\frac{1}{2}$ tons on toe; has a full 6″ lift and weighs only 82 pounds complete.

This heavy duty unit is a welcome addition to the company's broad line of lever, screw and hydraulic jacks.

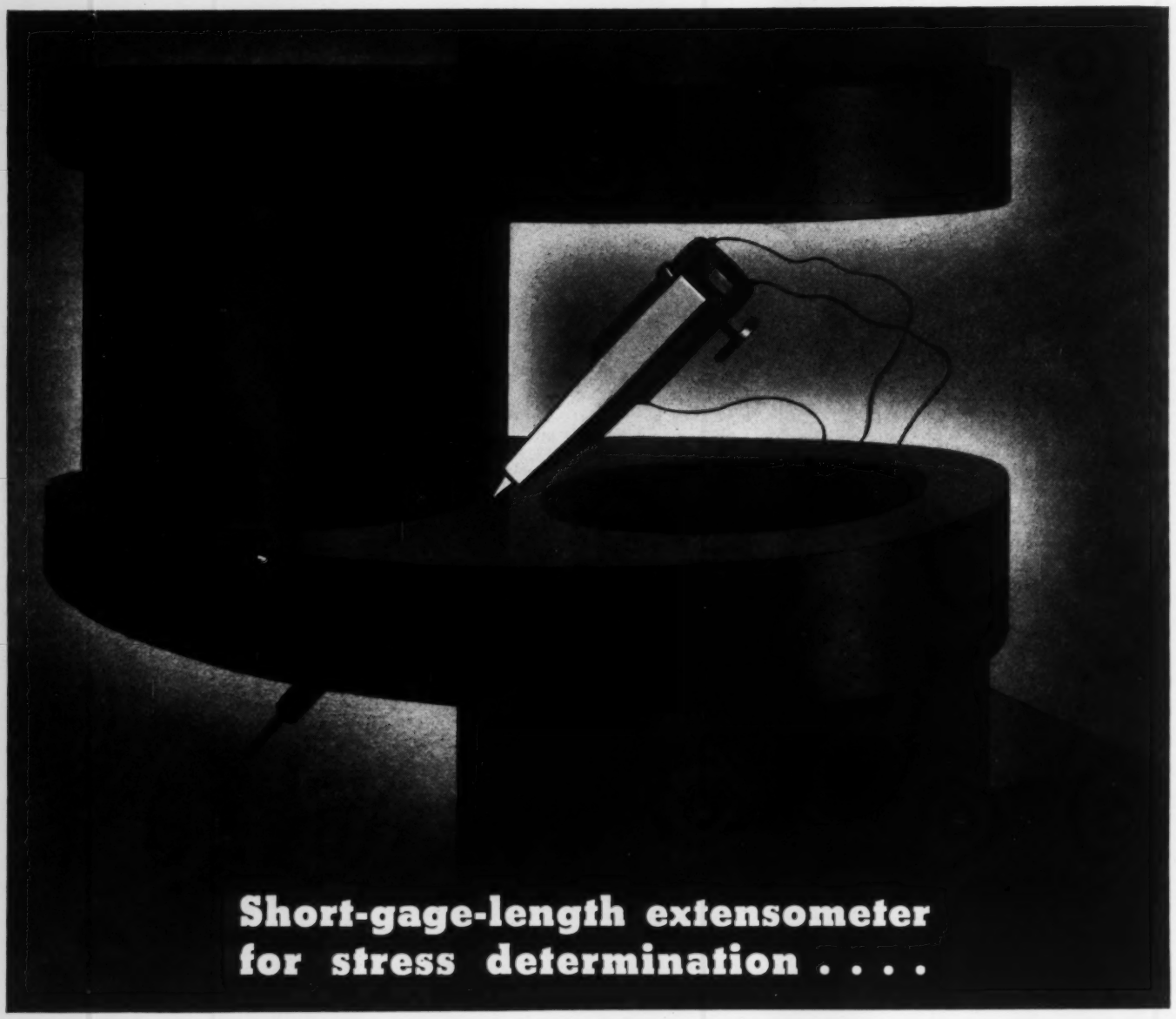
New Line of Motors for Magnesium Dust Locations

A new line of polyphase induction motors in sizes from 1 to 20 horsepower, NEMA frames 203 to 326 inclusive, suitable for use under magnesium dust conditions has been announced by the General Electric Co.



Labeled as suitable for Class II, Group E locations, the new line should find extensive use in the rapidly growing number of plants handling magnesium, particularly where fine magnesium dust is encountered.

Continued on Page 23



Short-gage-length extensometer for stress determination . . . .

Information supplied by "Mechanical Engineering"

Description of an extensometer of 1/16" gage length, and a discussion of its application to the study of stresses in crankshafts is given in the Journal of Applied Mechanics for March 1942.

The gage is intended to form a practical, convenient means of supplanting mathematical and experimental methods of studying stresses.

It is operated by a mechanical lever integral with one of the gage points, and a pair of ruled gratings which intercept a collimated light beam directed on a photocell.

Movement of the lever is transferred to one of the gratings. The light falling on the photocell is varied in proportion to the strain being measured. With gratings of 120 lines per inch and a 6¼ inch scale on the output micro-ammeter, the mechanical magnification of 250:1 is increased to 30,000:1.

The instrument is only 2¼ inches long, and weighs only ½ ounce. No prick punch marks are needed. The 1 lb. holding fork is enough for operation. Thus it can be conveniently used on fillets and irregular contours where other gages would not do.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.
MOLYBDIC OXIDE—BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"

Climax Molybdenum Company
500 Fifth Avenue • New York City

MOLY

• Keep Informed . . .

The new line has been developed to meet a need brought about by the extensive use of magnesium and aluminum in war production. In many cases, motors are being subjected to these metals in the form of fine powder, as used in incendiary bombs and for other military purposes, or from castings during grinding or polishing operations. Since these dusts are extremely combustible, they present a hazard classified by the National Electrical Code as Class II, Group E, requiring special motors and control.

The design of the new line of motors is based on a series of tests recently initiated by G. E. at the Underwriters' Laboratories, Inc., in which a sample 15-hp, 1800-rpm motor was subjected to a cloud of fine magnesium dust while operating under heating and cooling cycles simulating several years' operation in an industrial plant. Careful examinations of the motor after these tests indicated that it had successfully withstood all tests.

These motors are totally enclosed, with a nonventilated construction in the smaller ratings and a fan-cooled construction above 2 hp. Simple cast-iron end shields, stator frames, and fan housings make possible dust-tightness without complicating assembly or disassembly.

Other features of the new line include nonsparking bronze external fans, relatively straight and smooth external ventilating passages (for fan-cooled motors) to facilitate cleaning, permanently sealed-in leads, and a rotating labyrinth seal at the shaft opening.

Talkie-Visual Demonstration Helps G-E War Workers

This "talkie-visual" is being used at one of General Electric's plants to show the individual employee how the mechanism or part he produces functions in a magne-blast circuit breaker.

The demonstration takes two minutes. A series of colored lights and arrows displays the path of the arc from the parting of the breaker contacts and through its ever-lengthening serpentine pattern until it is stretched to death. Synchronized with this visual demonstration is the commentator's voice that explains every step during the breaker's complete opening and closing operation.

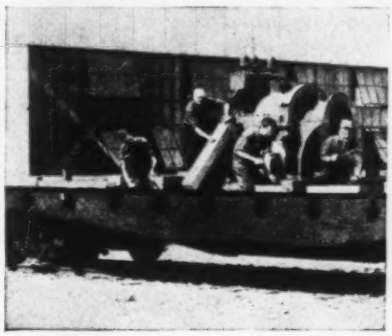
These workmen are "studying up" during lunch hour.

New G-E Plant Produces First Maritime Turbine in Record Time

Shattering all records for the production of merchant marine propulsion equipment, a new General Electric turbine plant, built as part of the company's $50,000,000 expansion for the Maritime Commission, celebrated Maritime Day, May 22, by announcing the shipment of its first C-3 cargo ship turbine.

This initial high pressure turbine unit is better than two months ahead of schedule, and company officials disclosed that the new eight-acre inland plant will have a production for the remainder of the year a third greater than originally planned.

The site of the plant was a barren swamp when General Electric was advised on last June 10 that the Maritime Commission would



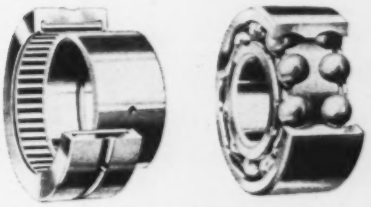
require more turbines. On June 18, the company submitted cost estimates. A lease agreement was signed July 9 with the Defense Plant Corporation, and on July 15 ground was broken.

Construction workers labored 24 hours a day, working at night under floodlights, through the fall and winter to drain and clear the ground. Before the factory structure was complete three shifts of production workers, many of whom had never done turbine work before, began work on machines protected from the weather by tarpaulins and heated by salamanders.

Continued on Page 24

YOU — our customers — are helping build Uncle Sam's tools of war. Maybe you're making dies, tools or machines that will turn out essential military equipment or for use in mechanized mobile units, planes or ships.

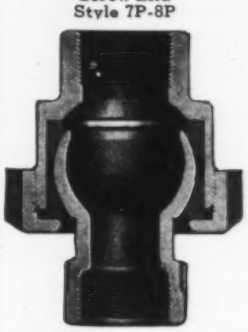
The entire output of McGILL Precision Ball Bearings is now being requisitioned for high production machinery and mechanized mobile war units. Our deliveries are governed by priorities. These restrictions will go when Victory comes. So plan now to demand McGILL Bearings for your post war machines.



BEARING DIVISION—1100 N. Lafayette Street

McGILL MANUFACTURING COMPANY, INC. VALPARAISO, INDIANA

Screw End Style 7P-8P



BARCO

JOINTS FOR INSULATORS FOR KEEPING ELECTRICAL CURRENT OUT OF PLATING AND CLEANING SOLUTION

7AP-8P

FOR USE ON STEAM AIR—GAS AND HYDRAULIC PRESSURE

FOR STEAM PRESSURE TO 300 POUNDS

SIZES 1/4 to 3" Incl.

WELDERS AND OTHER MACHINES WHERE PIPE LINES ARE REQUIRED

7AP-8BP

BARCO MANUFACTURING CO.
NOT INC.
1807 Winnemac Ave., CHICAGO, ILL.
In Canada—The Holden Co Ltd.

Write for Catalog

Time was also saved by United Engineers and Constructors, Inc. of Philadelphia, the contractors, evolving a plan whereby the concrete flooring and the foundations for the machine tools were laid before the erection of the steel. A brook had to be diverted before the concrete foundations were poured.

Erection of the 2800 tons of steel which went into the building was begun on November 7, 1941, and was completed on December 7, 1941, in exactly one month's time. With but a portion of the building enclosed with siding and roof, the work of moving the machine tools in was started.

With a large part of the structure open to the weather, these machine tools were placed in operation as quickly as they were installed, and the original force of 200 men, working around the clock in three shifts, worked in a "tented city" to get production under way. The building was formally occupied on February 12, 1942.

For the manufacturing program nearly 300 machine tools ranging in size from small milling machines and drill presses to huge 16-foot vertical boring mills weighing 220,000 pounds were required. These were obtained from 100 or more suppliers, extending from Providence, Rhode Island, to, ironically, Rising Sun, Indiana. Forty manufacturers supplied jigs and fixtures alone.

The original schedule of production of this propulsion equipment called for the delivery of the first shaft, consisting of a high and a low pressure turbine, by August 1, 1942. As a result of the speed in construction of the building, however, and the later speed in the manufacturing operation, the high pressure turbine has been shipped and the low pressure turbine is having its final tests. This is over two months ahead of the expectations of the Maritime Commission.

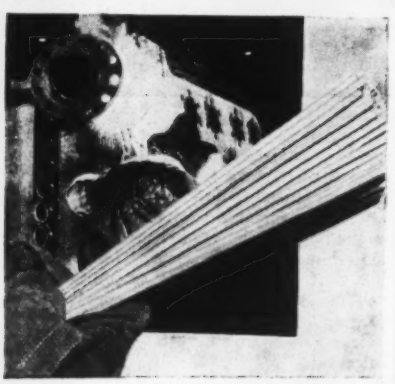
Since February 12, the date the huge, new building was formally occupied for manufacturing purposes, the force of workmen has been built up from the original 200 to more than 900 persons, working three shifts, 24 hours a day, seven days a week.

The 200 men who formed the nucleus of this force were selected months ahead of the start of actual production. The men forming it were drawn from General Electric departments, which were producing peacetime products. They came from the refrigerator department, since closed down for the duration of the war. They came from the locomotive division, where transportation and mining equipment is built. They came from departments where motors and generators were built, from the railway control department, and even from the foundry. Their superintendent is a locomotive man who had spent many years supervising the construction of such equipment.

These men were trained for their new jobs in other General Electric turbine plants. They returned, and the results of their learning are found in the new schedule they are establishing. Workmen to supplement this force have been drawn from various walks of civilian life.

All-Position A-C Arc Welding Electrode Meets High-Quality Requirements

An all-position, high-quality alternating-current electrode, Type W-26, extending the advantages and convenience of *high-quality* a-c welding to both vertical and overhead positions, has been announced by the General Electric Co.

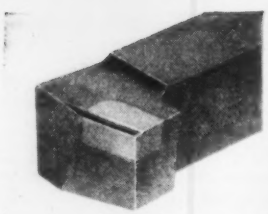


Alternating-current arc welding has already demonstrated its advantages for work in the horizontal and flat positions. The W-26, developed after intensive research, fulfills a long-felt need for a vertical and overhead a-c welding electrode that would give a high-quality job from the standpoint of physical characteristics as well as easy operation, adequate penetration, and practically flat fillet contour.

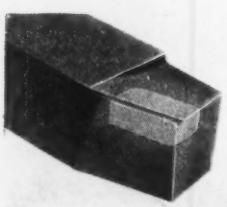
Type W-26 electrode complies with the requirements of the following specifications: A.W.S. Filler Metal Specification E6011;

Is KENNAMETAL* Economical?

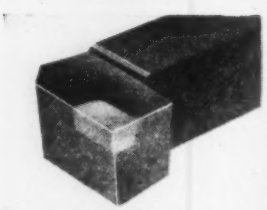
LOOK AT THE RESULTS OF THIS TEST



STYLE 21



STYLE 12



STYLE 9

OPERATION: ROUGH TURNING 155 MM. SHELL

TOOL	NO. SHELL PER REGRIND (AVERAGE)
KENNAMETAL (Grade KM)	130
KENNAMETAL (Grade KH)	127
KENNAMETAL (Grade K3H)	157
CARBIDE A	105
CARBIDE B	85
CARBIDE C	98
CARBIDE D	91

Because it removes more metal per regrind and more metal per tool life, KENNAMETAL is proving itself the most economical of all steel-cutting carbides, regardless of price.

In the shell machining test described, KENNAMETAL Grade KM turned more shells per tool than any other material tested, exceeding by more than 100% the number turned by some tools. One set of KENNAMETAL KM tools turned more than 3000 shells during the useful life of the tools.

KENNAMETAL machines steels of all hardnesses up to 550 Brinell at economical speeds and feeds, thus "hurrying up" production and reducing machining costs. Write for the facts about KENNAMETAL.

*Invented and Manufactured in U.S.A.

KENNAMETAL THE All American CARBIDE

McKENNA METALS Co.

367 LLOYD AVE., LATROBE, PENNA.

Foreign Sales: U. S. STEEL EXPORT CO., 30 Church St., New York
Exclusive of Canada and Great Britain

• Keep Informed

Navy Bureau of Ships Specification 46E3, Grade 3, Class 1; and the A.S.M.E. Boiler Code, Paragraph U68.

By the use of this electrode, welding shops and fabricators, who have heretofore needed to supplement their a-c welders with stand-by d-c welders for high-quality work in the vertical and overhead positions, will now be able to release these machines for fabrication work where d-c welding may be essential.

Type W-26 electrode compares faborably with the highest quality vertical and overhead welding characteristics available from reverse polarity direct-current electrodes. It provides a strong, forceful arc having good fusion, excellent penetration, and uniform characteristics free from arc blow. It is now available in $^1/_8$ in. and $^5/_{32}$ in. diameters; other sizes from $^1/_{16}$ in. to $^1/_4$ in. are expected to be available shortly.

Welds made with this electrode of the $^5/_{32}$ in. diameter show the following average physical properties, the data being obtained from all-weld-metal test specimens in the "as-welded" condition.

Ultimate tensile strength	72,000 lb per sq in.
Yield point	60,000 " " " "
Elongation in 2 inches	26 per cent
Reduction of area	46 " "

New South Bend Small Turret Lathe

A new bench model Turret Lathe for rapid production to close tolerances on chucking operations or bar work has just been announced by the South Bend Lathe Works. This lathe has a 10" swing over the bed and saddle wings, $1^3/_8$" hole through the headstock spindle, and 1" collet capacity. It is well adapted to second operation work.

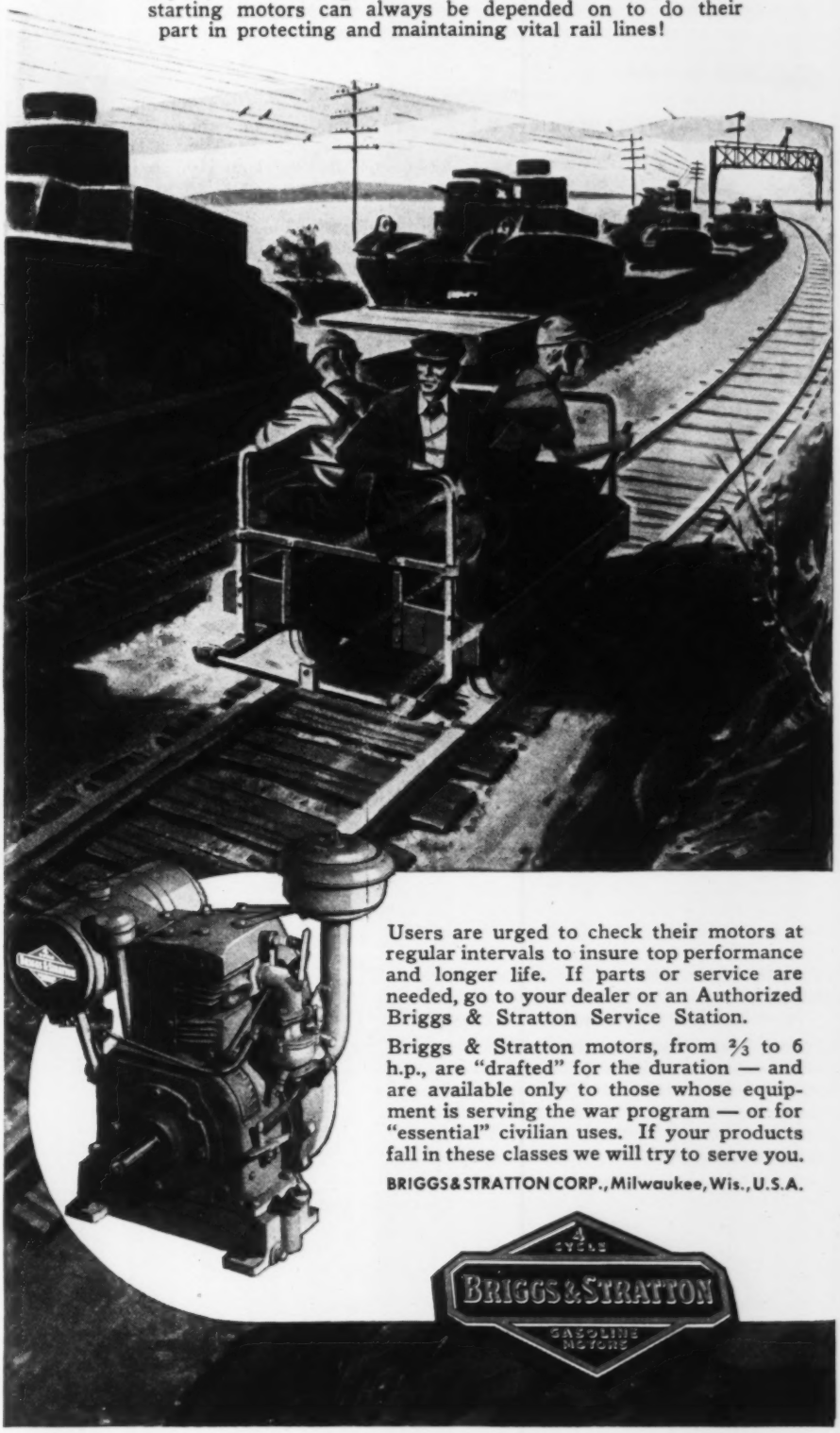
The handlever operated bed turret indexes automatically and has an adjustable stop for each of the six turret faces. The lathe is equipped with both a compound rest cross slide and a handlever cross slide, which are interchangeable. The latter is furnished with front and rear tool blocks which provide three tool positions. A quick change gear box supplies 48 longitudinal power feeds for the universal carriage, 48 power cross feeds for the compound rest cross slide, and 48 thread cutting feeds, 4 to 224 per inch. The underneath motor drive and back gears deliver twelve spindle speeds, from 97 to 700 R.P.M.

A large assortment of attachments and accessories simplify tooling for specialized work or second operation jobs. For information, write to South Bend Lathe Works, Department 6M, South Bend, Indiana.

Continued on Page 26

SMALL MOTORS ON PATROL —
Guarding America's Railways

Shipments of war material must have the "green light." Roadbeds need inspection and maintenance — bridges, railheads, and war shipments must be protected against saboteurs, wear and tear. So old-fashioned handcars and maintenance equipment give way to modern railroad machinery, much of which is powered by Briggs & Stratton 4-cycle, air-cooled gasoline motors. These sturdy, easy-starting motors can always be depended on to do their part in protecting and maintaining vital rail lines!



Users are urged to check their motors at regular intervals to insure top performance and longer life. If parts or service are needed, go to your dealer or an Authorized Briggs & Stratton Service Station.

Briggs & Stratton motors, from ⅔ to 6 h.p., are "drafted" for the duration — and are available only to those whose equipment is serving the war program — or for "essential" civilian uses. If your products fall in these classes we will try to serve you.

BRIGGS & STRATTON CORP., Milwaukee, Wis., U.S.A.

4 CYCLE BRIGGS & STRATTON GASOLINE MOTORS

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• Keep Informed . . .

De Laval Steam Turbine Company Receives Navy "E" Burgee

For outstanding achievement in the production of turbines, gears, pumps and other equipment vital to the United States Navy, the Navy "E" burgee, symbol of "Work Well Done," was presented to the De Laval Steam Turbine Co., Trenton, N. J., June 29, 1942, at which time also the employees received "E" lapel insignia. The presentation speech made by Rear Admiral William C. Watts, U.S.N., Ret., was responded to by H. L. Watson, Executive Vice-President of the De Laval Company. Other speakers were the Hon. John A. Hartmann, Mayor of Trenton, and Judge Harold C. Wells, of the Court of Errors and Appeals of New Jersey. The presentation ceremonies were held in the War Memorial Building at Trenton and were attended by about 1800 De Laval employees and invited guests. Among the latter were numerous officers of the Navy and Army and officials of shipyards and concerns manufacturing marine equipment. The presentation ceremonies were followed by a reception and buffet supper at the Trenton Country Club.

To date over eleven million horsepower of De Laval marine turbines and speed reducing gears have been delivered, or are under construction, for the propulsion of destroyers, cruisers and merchant vessels, as well as large numbers of centrifugal pumps for marine service, De Laval-IMO rotary displacement pumps for fuel and lubricating oils, centrifugal compressors for submarines, and worm reduction gears for use with steam turbine-driven auxiliaries. The production of equipment for the Navy by the Company during the first four months of 1942 exceeded, in equivalent man hours, its entire production during World War I.

In the illustration above is the presentation of Navy "E" burgee, showing Rear Admiral Wm. C. Watts, U.S.N. (Ret.), Lieut. (jg) Thomas Dewart, U.S.N. Office of Public Relations, Lieut. J. W. Gessford, U.S.N. Office of Public Relations, H. L. Watson, Executive Vice-President, H. W. Johnson, Vice-President and Works Manager.

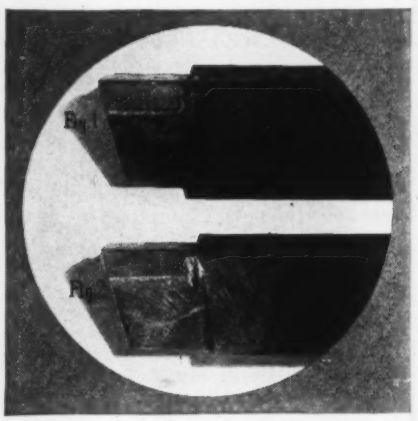
New Process of Joining Tips to Tools

In view of the vital role which metal working tools are playing in the war production program . . . the new Krembs process of joining cutting tips to tools assumes major importance.

This is an improved method of joining carbide and all other types of cutting tips and cutting blades to tool shanks. The plan is adapted to both small and large scale production and can be used with the furnace, torch, or spot-welding methods.

The process comprises a specially developed "Fluxined-Spelter" which is used to brush onto the contacting surfaces of both the cutting tip and the tool shank. The work is then assembled to form a tight fit and brazed. When completed, the finished braze looks like a gold-plated joint with absolutely no waste of joining material and the cleaning job is almost nil. By this process, 100% perfect bonds are obtained.

While there are several other methods of doing this operation, many of the users who have tried the Krembs process agree on its time-saving advantages and its superior results, as shown in the photographs below.



Unretouched illustrations of cutting tips brazed to shanks by the Krembs process.

Fig. 1 shows assembly just as it comes out of the brazing oven and indicates the small amount of flux scale left on the work.

Fig. 2 indicates the same piece as in Fig. 1 after the flux scale has been removed, showing the perfect bond obtained by the Krembs process.

Complete information about doing this work will be furnished by Krembs and Company, 666 West Ohio Street, Chicago, on request.

Ultra High Pressure Flow Meter

In high pressure process operations in the neighborhood of 5000 lb. per sq. in. flow measurement has been impracticable with mechanical head type meters employing a stuffing box. Accuracy, freedom from maintenance, and complete safety are now secured by a special adaptation of the ring balance (tilting U-tube) which has no float, stuffing box, or pressure-tight bearing; being entirely closed and without internal working parts.

The mercury sealed manometer is a stainless steel ring 15 inches in diameter. The ring is balanced on knife edges at its geometric center. The partition at the top of the ring is formed of a solid stainless steel

block suitably drilled for the pressure connections. Nickel tubing connects the top of the ring to the center of rotation where they join the free (inboard) ends of the twin 6-inch nickel torsion tubes. The outboard ends of the torsion tubes are anchored and to these the pressure lines from the primary elements are connected. By this design the ring tilts 10° for the full differential range measurement which may be between 4 and 9 inches of mercury depending on the cam weight supplied. The cam extracts the square root relationship so as to express the flow directly in uniform increments on the 36-inch indicating scale which may also be combined with an integrator and/or 12-inch recording chart feature. The exceptionally rugged construction combines every desirable detail such as ball bearing cam strap sheave, integral plumb bob and alignment scale, lens type metal gaskets, mid-scale calibrating pin so as to afford maximum dependability and operating convenience. These meters made by Cochrane Corp., Philadelphia, Pa., are tested under 7500 lb. per sq. in. and are in successful use in several plants for measurement of nitrogen, hydrogen and ammonia gases at pressures above 5000 lb. per sq. in.

• BUSINESS CHANGES

Onsrud Enlarges Plant to Step up Deliveries

With the addition of a second story, the Onsrud Machine Works, Inc., will conclude a building expansion program begun several months ago. An entirely new west wing was recently added as step number one, and raising the roof to add another floor is the final step.

The total increase of floor space will result in a production capacity almost two times as great as before. Deliveries on Onsrud machines for wood and metal working, as well as all cutter equipment, can now be made almost within normal periods of time, in spite of the great numbers of orders being constantly received and scheduled.

Raising of the roof to build a second story was quite an achievement in war time construction. It was essential for the contractors, the Paul Gaus Construction Company of Chicago, to plan the work so that Onsrud employees were disturbed as little as possible. Onsrud production had to continue to meet promised delivery dates. Although a maze of supports and framework had to be set up around them, Onsrud machinists continued working throughout the entire construction period. A panel ceiling with taped joints was built, and over this was poured an 8-inch reinforced concrete slab, to form the floor of the entire second story.

Twin Disc Moves Hydraulic Division

New machines and new facilities are now being installed in the Twin Disc Clutch Co.'s plant at 1310 Preston Street, Rockford, Illinois, and a considerable increase in the number of employees will take place very shortly, it has been announced. The expansion results from the creation of a separate division of the Twin Disc Clutch Co. to handle the development, production and sale of Hydraulic Drives and Torque Converters, formerly a department of the company's operations at Racine, Wisc.

Mr. R. M. Schaefer has been named vice-president in charge of the Hydraulic Division of the Twin Disc Clutch Co., all of the activities of which now will be concentrated in Rockford. The products to be manufactured involve fluid-type transmissions, which are finding ever-increasing applications in many industrial fields. This development has been carried on extensively by the Twin Disc Clutch Co. for the last five years. A considerable number of these units, which were previously produced in Racine, are now in service in a wide variety of equipment operating throughout the United States as well as in South America and Canada. Further engineering research and development will be carried on by the staff of Twin Disc engineers recently transferred from the Racine plant to the laboratories now made available in the Rockford plant.

As with most industrial concerns today,

Continued on Page 28

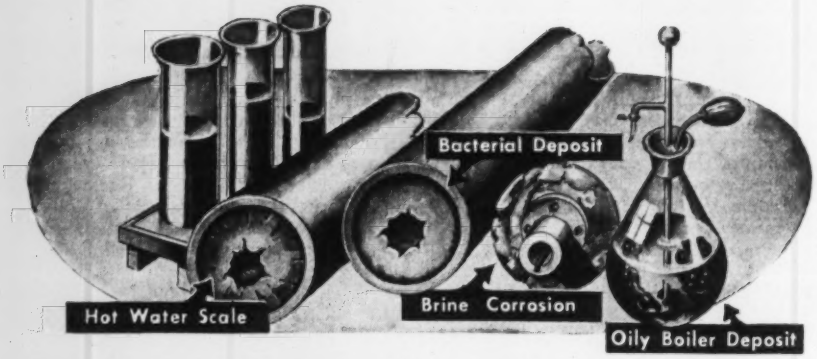
War jobs demand speed with accuracy

. . . Arkwright gives you both!

Those blueprints whirling through the machine must be sharp and clear – or else! Mistakes on war jobs can be as bad as sabotage – why risk them by using inferior tracing cloths? Arkwright's superb, uniform, closely-woven finish is your best protection. It assures perfect jobs – now and for years to come. Give your men this inexpensive aid to better work. Arkwright Finishing Company, Providence, R. I.

Arkwright TRACING CLOTHS

AMERICA'S STANDARD FOR OVER 20 YEARS



TEST TUBES SAVE WATER TUBES

Haering products and Haering service are directly stepping up war production. They control corrosion in boilers condensers and engine cooling systems and all water equipment used in gasoline production, munitions, tanks and many other war products.

Our ability to read water and our many glucosate correctives are doing active service in war industries.

Send for booklets on scale and corrosion control, cooling waters, proportioning problems.

Write for sample containers and data forms to give us a complete picture of your problems.

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GENERAL OFFICES: 205 West Wacker Drive
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WHEN HEAVY LOADS CAUSE Machine Tool Chatter or Hot Bearings and Gears

USE "STURACO" ★★★★ **EXTREME PRESSURE ("EP")**

MACHINERY OILS & GREASES

• Here is the answer to many of your lubrication problems caused by today's production demand of heavy loads, high speeds, and continuous operation of machinery and machine tools. "Sturaco" EP Oils and Greases, without any change in your accustomed viscosity or consistency, offer a minimum of *300% increased load carrying capacity* with notable low torque.

Lubrication of ways — spindle bearings — gear heads — elevating screws — speed reducers — are typical examples where "Sturaco" application has solved tough lubrication problems. If you need help, write or phone today.

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SEND FOR the new "Sturaco" booklet outlining laboratory research behind this genuine development, describing typical applications and listing various grades.

For All Cutting Fluid Problems
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Warehouses in All Principal Metal Working Centers

• Keep Informed

practically all of the work of the Twin Disc Clutch Co. is concerned with war production, and the new arrangement will speed up deliveries, both of Hydraulic Equipment and the other products manufactured in Racine. In view of the increasing importance of Hydraulic Drives, a relatively new item, it is anticipated that peace time needs will continue to demand all the production facilities now being established in Rockford.

Mr. P. H. Batten, one of the men who originally organized the Twin Disc Clutch Co. in 1918, is extremely active as the President of the Company in Racine, Wisconsin. Assisting Mr. Schaefer in Rockford will be Mr. R. P. Exten, Plant Manager, Mr. J. R. Murphy, Purchasing Agent, and Mr. R. T. Rehwald, Assistant Secretary of the Company.

Edgar Appointed by Allegheny Ludlum

A prominent figure in civic activities of the Pittsburgh area, Ralph C. Edgar, has been named Manager of Industrial Relations for the Allegheny Ludlum Steel Corp. Announcement of the appointment was made by W. F. Detwiler, Chairman of the company, who described it as a move "to encourage and promote the highest degree of cooperative effort in Allegheny Ludlum's own and subsidiary plants".

A native of Wilkinsburg, Pa., Mr. Edgar attended Wilkinsburg High School, University of Pittsburgh and Princeton University. After four years as a newspaper reporter in Trenton, N. J., and Pittsburgh, he entered the employ of Westinghouse Electric & Manufacturing Co. where he was a publicity representative and editor of the employees' publication.

He later became engaged in public relations work for a number of industrial, commercial and organization clients. Continuously since 1936 he has worked for the advancement of flood control for Western Pennsylvania, in the capacity of secretary of the Tri-State Authority and secretary of the U. S. Flood Control Federation. Since 1940 he has also served as industrial manager of the Chamber of Commerce of Pittsburgh.

He is a member of the Pittsburgh Personnel Association, the National Press Club, the Propeller Club of the United States, Ohio Valley Improvement Association, and Pittsburgh Advertising Club.

• LATEST CATALOGS

Stationary Pump Instruction Manual

Quimby Pump Co., 345 Thomas St., Newark, N. J., have just issued their latest Stationary Instruction Manual. It contains useful rules for installation, operation and maintenance. Routine servicing as may be necessary when done correctly to insure constant availability of equipment for use and trouble-free long life. Many of the rules apply to other types as well as Quimby Pumps.

Haering Issues Reprint on Economics of Water Conditioning

The economics of water conditioning for scale and corrosion control play an important part in keeping war production at peak efficiency without outage. Ray C. Rohrdanz, chemical engineer, is the author of an inter-

esting article discussing this subject in relation to the petroleum industry which appeared in the May 1942 issue of The Petroleum Engineer.

"Economics of Water Conditioning for Scale and Corrosion Control" is the title of this discussion which may be interpreted in terms of general industrial operations although the discussion cites the petroleum industry as primary examples of the importance of scale and corrosion control.

Recognizing the current importance of this discussion, the D. W. Haering & Co., Inc., water consultants in Chicago, have prepared reprints of Rohrdanz' article for distribution to those interested in or responsible for industrial water control.

Copies of the "Economics of Water Conditioning for Scale and Corrosion Control" may be obtained without charge or obligation by addressing requests to D. W. Haering & Co., Inc., 205 W. Wacker Drive in Chicago, Illinois.

Complete Booklet on Electric Equipment for Aircraft Production

An attractive 42-page booklet (GEA-3395) containing almost 200 photographs of applications and products has recently been issued by the General Electric Co. to illustrate and describe the wide range of precision-built equipment G. E. offers for the aircraft industry. The major part of the booklet is confined to equipment for aircraft production although several pages are devoted to descriptions of equipments for installation in aircraft.

Described in the bulletin are load-center power distribution systems, motors and controls for many uses, resistance welding controls, arc welding equipment, heat-treating equipment, testing equipment, lighting, etc., and such equipments for the plane as instruments, voltage regulators, motors, amplidyne sets, relays, generators, dynamotors, superchargers, radio, and others.

Hints on Saving Through Good Operating Practices

Designed to help get maximum production from equipment and eliminate unnecessary shut-downs, a new operating practice manual, just published by Johns-Manville, gives many practical suggestions on getting better service from maintenance materials. Called "101 Suggestions for Good Operating Practice," the guide outlines in tabular form many hints on lengthening the life of packings, insulations, roofings, friction materials, and refractory products. Conveniently set up for quick reference, the manual contains a summary of good installation and maintenance practices, providing a handy guide for maintenance engineers.

Copies of the book, Form PP-9A, will be furnished upon request to Johns-Manville, 22 East 40th Street, New York, N. Y.

A Guide to Wartime Care of Electric Motors

Allis-Chalmers Manufacturing Co., announces the publication of an entirely new kind of maintenance handbook—"A Guide to Wartime Care of Electric Motors."

According to the company, the times demand a fresh approach to problems of motor care. Increase in the average motor's working time from 1800 to 8700 hours a year is cited.

Other new factors noted are the importance of continuous motor operation to the war effort, increasing difficulty of obtaining new motors, and the lack of previous experience with electric motors on the part of the thousands and thousands of new workers now being pressed into service in war production plants.

Unlike most maintenance books, "A Guide to Wartime Care of Electric Motors" applies to *all* makes of standard, general-purpose motors. It contains no advertising.

To clarify the overall problem of motor care, this new handbook treats separately each factor opposing long and trouble-free motor life. Thus the heading to the first section is—"Electric Motor Enemy No. 1 . . . Dust."

Other enemies—considered in turn—are Moisture, Stray Oil, Friction, Vibration, Misalignment, Uneven Wear, Overload and Underload.

Last section of the booklet is a "Quick Diagnosis of Motor Ailments," broken down into symptoms you can see, can feel, can hear. Possible causes and cures appear beside each symptom.

To make the aims and methods of motor care crystal-clear to the tyro—interesting to the old hand—"A Guide to Wartime Care of Electric Motors" is filled with idea-pictures drawn in cartoon style. Thus Allis-Chalmers hopes it will prove particularly valuable for training new employees—a major problem in many plants.

Continued on Page 30

This is no place for a LOOSE NUT

. . . and that goes too for thousands of other vital positions on America's fighting airplanes where careful designers have placed Elastic Stop Nuts. These self-locking self-gripping fastenings have proved, through fifteen years of reliable service on aircraft, that they remain tight under all combinations of vibration, stress, shock, exposure to weather, and prolonged heavy duty. They are used today on *every* military and transport airplane built in the Western Hemisphere.

There are more Elastic Stop Nuts on America's airplanes, tanks, Naval vessels, and other war equipment, than all other lock nuts combined.

•

ELASTIC STOP NUTS may be the solution to *your* fastening problems. Sample nuts, for testing, will be furnished without cost or obligation.

•

» *Write for folder explaining the Elastic Stop self-locking principle*

ELASTIC STOP NUT CORPORATION • 2375 VAUXHALL ROAD • UNION, NEW JERSEY

Elastic Stop SELF-LOCKING NUTS
REG. U.S. PAT. OFF.
AND AIRCRAFT FITTINGS

WITH THE RED LOCKING COLLAR . . . SYMBOL OF SECURITY

Copies of this new book are free. Allis-Chalmers announces it will mail "A Guide to Wartime Care of Electric Motors" free of charge to any executive, engineer, or maintenance man sending in for it on his company letterhead. Address Allis-Chalmers Manufacturing Co., Advertising Department, Milwaukee, Wis.

Rotary Positive Blowers

Rotary positive blowers are covered by Bulletin 22:23-B-11 just issued by the Roots-Connersville Blower Corp., Connersville, Ind., comprising twenty pages, including cover.

This bulletin is profusely illustrated, showing numerous installation views, details of construction, etc.

On the inside front cover will be found a brief account of the inception of the rotary positive blower by the Roots brothers, who patented the principle in 1859. On pages four and five, three interesting curves are presented in connection with a discussion of the operating principle of these blowers.

Page six presents views of four different types of gears in matched pairs, and the manufacturer stresses the importance of accurate gear cutting, which they do themselves. On the opposite page are sectional views of standard blower types.

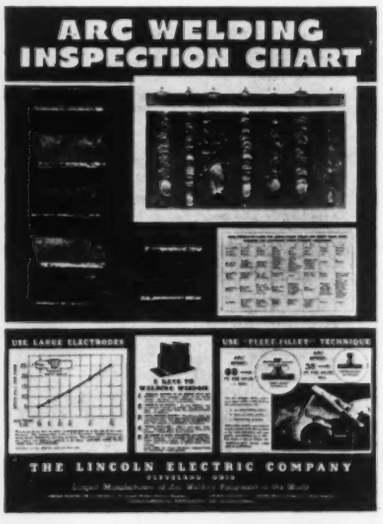
Following this are eight pages of installation views and comment regarding the many varied applications which rotary positive blowers have found in a diversity of industry.

On pages sixteen and seventeen typical accessories are shown and discussed in considerable detail. Specifications are given on page eighteen, and the inside back cover is devoted to a table of sizes, including capacity, speed, horse power, etc.

A copy of this bulletin may be had by writing to Connersville or by addressing the company at New York, Chicago, Pottstown, Pa., Pittsburgh, Boston, Detroit, St. Louis or San Francisco.

Weld Inspection Chart Published by Lincoln

An arc welding inspection chart, which will provide welding inspectors and others concerned with weld production a simple and extremely helpful aid for use in inspecting welds, has just been published by The Lincoln Electric Company, world's largest manufacturer of arc welding equipment, Cleveland, Ohio.



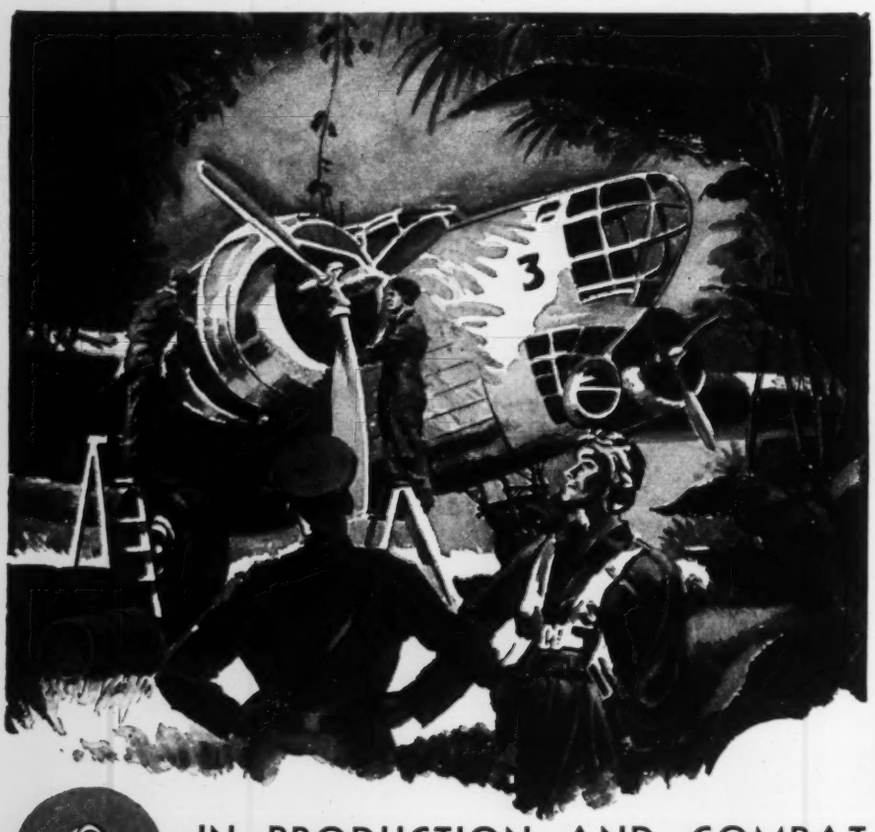
The chart (see illustration), presents very graphically the different types of welds obtained when the work is done normally, with normal current, voltage and speed, as compared with those obtained when these factors are not normal.

"Upon inspection after welding, certain tell-tale signs will reveal considerable information to a qualified inspector," according to A. F. Davis, Vice-President of the company.

"Items to consider in inspection after welding include the size and shape of bead, appearance of the bead, undercut, overlap, location of craters (indicating where the operator started and stopped welding). A study of the weld and proper interpretation of tell-tale signs will disclose other conditions of welding."

These conditions are illustrated by enlarged and detailed photographs on the chart.

Accompanying the photographs is a table indicating the burn-off of the electrode, the penetration of fusion, the appearance of the bead and the sound of the arc with each value of current, voltage and speed of welding. For example, with normal current, voltage and electrode speed, burn-off of the electrode gives a normal appearance of the



IN PRODUCTION AND COMBAT
AAF FILTERS protect our fighting planes from DUST
The whole story of the part which Dust Control plays in enabling industry to keep abreast of war production demands can't yet be told.
Only the men behind the scenes, and the American Air Filter engineers who have been responsible for designing and installing the equipment, know how vital adequate dust control is to maintaining deliveries and worker efficiency.
The air craft industry is typical. Not only does clean air speed up delivery of planes but it also plays an important role in keeping them flying. AAF airplane engine filters are saving valuable replacement parts, reducing oil and gas consumption and lengthening the periods between overhauls.
If dust is a problem in your plant—write us. We can help you too! Send for free booklet "AAF in Industry."
AMERICAN AIR FILTER COMPANY, INC.
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AMERICAN AAF AIR FILTERS

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weld coating, a fairly deep and well-defined penetration, excellent fusion of the bead with no overlap, and an arc that burns with a sputtering hiss plus sharp cracking.

The inspection chart also illustrates the use of the "Fleet-Fillet" technique of welding, developed by The Lincoln Electric Company, which nearly doubles the normal welding speed. The chart also illustrates how the speed of welding increases as the size of the electrode increases.

The chart is available free of charge to inspectors of welding and others concerned with welding.

Simplicity and Speed in Making Whiteprints

"Simplified Print Making" is the title of a new booklet just issued by Ozalid Products Div., General Aniline & Film Corp., Johnson City, N. Y. A concise, informative presentation of the Ozalid Process that revolutionized print making. Ozalid combined printing and dry development in a single, compact unit, using Ozalid sensitized materials to turn out a variety of positive-type whiteprints in a few seconds. Ozalid has perfected machine after machine specifically suited to meet big production demands, medium print making requirements and small office needs. Ozalid is the only complete, all-purpose print making process in the reproduction field—and is economical, time saving, labor saving.

Illustrates and describes the Ozalid Whiteprint Machines and Dry Developing Machines, Sensitized Materials. Explains the Ozalid Process, tells how to make corrections and gives notes about print making.

Maintenance Hints Notebook Now Available

To keep the tools of war industries in full operation, a two-volume set of maintenance rules and suggestions is now available to maintenance men concerned with the care of electrical apparatus in industry.

Written by engineers of the Westinghouse Electric & Manufacturing Co., the books total 220 pages and are made up of 15 chapters for loose-leaf insertion in 5 × 7-inch binders. Each chapter is brought up to date and additions will be made as conditons warrant.

Volume one covers inspection of electrical apparatus, insulation materials and applications, the cleaning, drying and testing of insulation, commutator maintenance, starting and regulating a-c, d-c and squirrel cage induction motors. All the necessary information for proper maintenance of insulation and motors is given with diagrams, tables, and charts to make the text easy to follow.

Volume two is devoted to contactor maintenance, the inspection of transformers, and a chapter on transformer connections. A number of wiring diagrams embrace all of the more common connections for two and three phase, 25 and 60 cycle, power transmission.

Copies of maintenance hints notebooks are available to maintenance men from department 7-N-20, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

New Pump Data Sheets

As a special war-time service to pump operators, Goulds Pumps, Inc., has made available the company's "Pump Application Sheets," originally prepared for the confidential use of its own salesmen. These sheets, of two to eight pages each, include

Continued on Page 32

Not All Pilots Sail the Seas

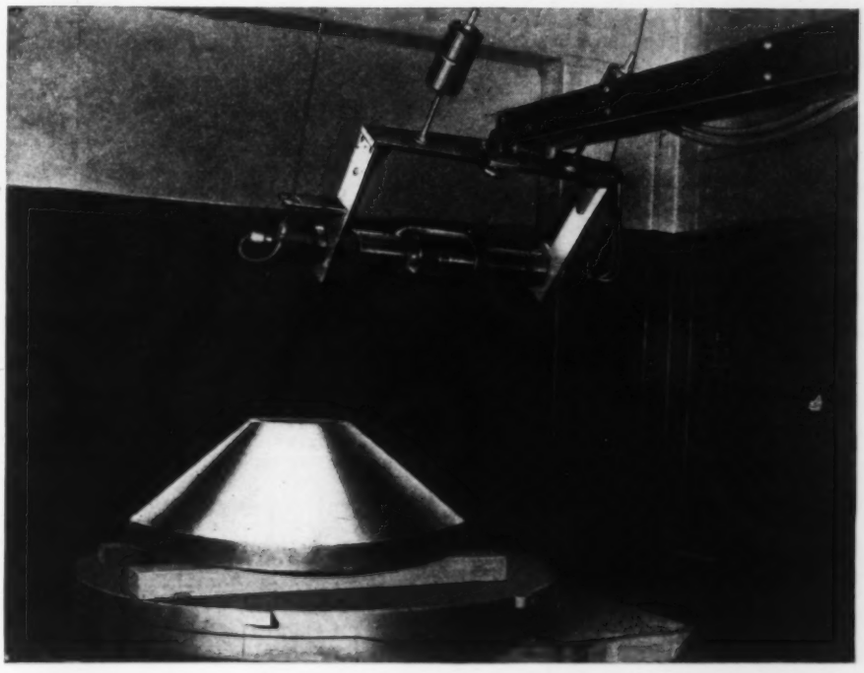
When a steamer "drops the pilot," it means the dangerous rocks, shoals and currents are passed. From there on, the navigator is guided by his own knowledge and calculations. The pilot has shown the way.

Amsco uses pilots, too—to point the way to a consistently sounder product. These pilot castings—the first of each new design or new foundry practice—are carefully checked by a giant 400,000 volt X-ray machine at the Amsco Chicago Heights plant. This X-ray, until recently one of the largest used in metallurgical work, is capable of making diagnostic radiographs through five inches of steel.

These investigations are made not only to detect any defects in that particular pilot piece, but also to supply data to the engineer, foundryman and metallurgist which will enable them to correct recurring defects by changes in design, or method of production. The result is that the customer gets a superior product of known quality without extra charge.

Added to this is a research laboratory which serves Amsco and other divisions of the company, that is equipped with standard and special testing devices, and is staffed by competent research workers. The purpose of these technicians and this elaborate equipment is to evolve changes in metals or methods that will give users of Amsco products, castings more uniform in quality or better in performance.

Today more than ever before, American industry demands speed, speed and more speed. It must have consistent performance, too. Amsco 13% Manganese Steel castings deliver maximum service, with minimum maintenance and replacements to meet the nation's insistence on metals and machines that can take it under exceptional conditions. Amsco is doing its duty in this "war of production."



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OF THE AMERICAN BRAKE SHOE & FOUNDRY CO.
Chicago Heights, Illinois

Manganese Steel Castings for shocks and abrasion.
Chromium-Nickel Alloy Castings for heat and corrosion resistance.
Power Shovel Dippers. Dredge and Industrial Pumps.
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both elementary and advanced technical data on selection, installation, operation and maintenance of all types of industrial pumps for general and specialized services.

The sheets, with an eighteen-page booklet, "Pump Fundamentals," are furnished without charge, in a durable file folder containing an extra pocket for the recipient's own notes and hydraulic data. From six to fourteen sheets will be placed in each folder, depending upon the type of information deemed most useful to the recipient. Additional copies of individual sheets or of the complete folder will be furnished on request, without charge. Address requests to Department 44, Goulds Pumps, Inc., Seneca Falls, N. Y.

It is expected that the more elementary sheets will be of great assistance in training new, inexperienced employees, while the more technical sheets should help operators get maximum performance from existing equipment regardless of its manufacture.

Air Cooled Voltage Regulators

A new 8-page booklet which gives a quick non-technical summary of the outstanding high lights of the Type SA air-cooled induction feeder regulator is announced by Westinghouse Electric & Manufacturing Co.

Air cooling provides a new and better solution to the problem of feeder voltage regulation. It eliminates the hazard and associated expense of liquid coolants. These and many other advantages are outlined in the new booklet, together with outstanding design features and a cutaway diagram showing the air cooling process.

The last four pages of the booklet are devoted to construction detail, and the various parts of the regulator are pictured and described. The new compact control panel simplifies inspection and adjustment; and the improved relay guarantees constant voltage without the use of holding coil and resistors.

A copy of booklet B-3080 may be secured from department 7-N-20, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

Kennametal Steel-Cutting Carbide Tools and Blanks

The McKenna Metals Co., 367 Lloyd Ave., Latrobe, Pa., has just issued a new catalog 42V covering specifications and prices of Kennametal steel-cutting carbide tools and blanks.

Complete in every detail, the new catalog contains both line drawings and large halftone illustrations of each standard type Kennametal tool. In addition, typical applications of each style of tool are illustrated by line drawings. Several pages are devoted to the selection and design of tools and blanks, chip breaker designs, correct grinding, boring tool set-ups and other engineering data. A visual index covering inside of the front and back covers makes it simple for the reader to find information relative to the exact type of tool in which he is interested.

Copies of the new Kennametal Catalog 42V will be forwarded upon request.

Haering Releases Case History on Condensate Corrosion Control

Case history data on condensate corrosion control by the Haering Process of direct introduction of chemicals into the steam has been released for the first time in a new Haering six-page pamphlet entitled "Cook County School of Nursing Solves Condensate Corrosion Problem."

This new publication tells the story of a severe condensate corrosion condition in the new seventeen story Cook County Nurses Home where double extra heavy wrought iron piping failed in thirty days service. This exceptional condition provides the background for interesting data on the application of Tetra Phospho Glucosate to steam conditioning.

The story of the solution of this corrosion problem is illustrated with pictures of piping before and after steam conditioning as well as charts recording the analytical results and changes during the test period. Here, for the first time, is printed the actual facts regarding steam conditioning for condensate corrosion control.

Condensate corrosion is an enemy of industrial production and large scale operations that has proved particularly troublesome under present conditions of metal shortages. In the national interest, Haering & Company is making this new bulletin available to engineers and technologists interested in the solution of this corrosion problem.

Copies of "Cook County School of Nursing Solves Condensate Corrosion Problem" are available without charge or obligation to those addressing requests to D. W. Haering & Co., Inc., 205 W. Wacker Drive in Chicago, Illinois.

PROFESSIONAL SERVICE

In ALL BRANCHES of the ENGINEERING FIELD

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Engineering Organizations
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ONE Organization to Handle ALL Water Problems.
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On many of the ships recently built and now under construction, the methods of handling fuel and lubricating oil have been vastly improved by adoption of the

De Laval-IMO Oil Pump

Its exceptional compactness and its ability to operate directly connected at motor and turbine speeds save space and weight, and greatly simplify the power plant layout. There are only three moving parts; no valves, no gears, no separate bearings, no reciprocating parts. The pump interior is readily accessible.

Ask for Catalog 1-96.

IMO PUMP DIVISION
of the
De Laval Steam Turbine Company
Trenton, New Jersey

COMING MEETINGS AND EXPOSITIONS

For the next two months

SEPTEMBER

7–11 American Chemical Society, Fall Meeting, Hotel Statler, Buffalo, N. Y.

9–11 American Institute of Electrical Engineers, Pacific Coast Convention, Vancouver Hotel, Vancouver, B. C.

22–24 Association of Iron and Steel Engineers, Annual Convention, Hotel William Penn, Pittsburgh, Pa.

28–Oct. 1 Technical Association of Pulp and Paper Industry, Fall Meeting, Hotel Statler, Boston, Mass.

30—Oct. 2 A.I.M.E. Regional Meeting—Joint meeting ASME Fuels Division and AIME Coal Division, Hotel Statler, St. Louis, Mo.

OCTOBER

5–9 National Safety Council, 31st National Safety Congress and Exposition, Stevens Hotel, Chicago, Ill.

12–14 The American Society of Mechanical Engineers, 1942 Fall Meeting, Hotel Sagamore, Rochester, N. Y.

12–16 American Society for Metals, National Metal Congress and Exposition, Cleveland Public Auditorium, Cleveland, O.

12–16 American Welding Society, Annual Meeting, Hotel Cleveland, Cleveland, O.

15–17 American Society of Tool Engineers, Semi-Annual Meeting, Springfield, Mass.

For Calendar of coming A.S.M.E. Meetings see page 628 in the editorial section.

This New Tracing Cloth Prevents Scars and Stains on your Drawings

PHOENIX is an improved tracing cloth that defies perspiration stains and water marks—*that holds pencil smudges and erasure scars at a minimum.* Now you can have clean tracings, in pencil or ink, free from the untidy "ghosts" that reproduce on blueprints!

For PHOENIX is ghost-proofed by a remarkable new process that defies moisture, and gives you an unusually durable working surface. You can use harder pencils with this improved cloth and get sharper lines with less tendency to smudge. Even 6H pencil lines show clearly, and reproduce sharply! Erasing does not mar the drawing surface; erased areas take pencil smoothly —and ink without feathering. The new white color and increased transparency provide excellent drawing contrast and produce strong blueprints.

Let PHOENIX prove its merits on your own drawing board. See your K&E dealer, or write for a generous working sample and an illustrated brochure.

EST. 1867

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TRACING CLOTH

for pencil *and* ink

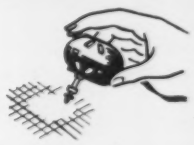
PHOENIX DEFIES MOISTURE GHOSTS

Perspiration and water splashes on ordinary tracing cloth create "ghosts" which reproduce on blueprints. PHOENIX Tracing Cloth withstands actual immersion in water for fully 10 minutes at a time! *Perspiration and water marks will not stain it!*

PHOENIX LESSENS SMUDGE GHOSTS

The new improved surface of PHOENIX Tracing Cloth permits you to use harder pencils (5H and 6H) and to get sharper lines with less tendency to smudge.

Result: Cleaner tracings and blueprints.



PHOENIX REDUCES ERASURE GHOSTS

Ordinary tracing cloths become scarred when erased... erased spots produce ghosts on blueprints.

PHOENIX has a durable drawing surface that reduces working scars to a minimum.

Cleveland Owners

Give You the Low-Down

"You've certainly come to the right place to get the low-down on Cleveland Worm Gear Speed Reducers," says the Manager of a Midwest plant, "because we have used a lot of them over a good many years.

1—"*We bought fifty Clevelands* on our first order, nearly 20 years ago.

2—"Since then, we have ordered additional Clevelands repeatedly.

3—"Cleveland Drives operate our machines uniformly.

4—"We have no shutdowns due to Drive failure."

Cleveland has devoted its entire 30 years to producing Worms and Gears and nothing else. Their good qualities have led this and many another manufacturer to order more Clevelands—dozens or hundreds—after the first purchase.

The Cleveland Worm & Gear Company, 3264 East 80th Street, Cleveland, Ohio.

Affiliate: The Farval Corporation, Cleveland, Centralized Systems of Lubrication.

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CLEVELAND WORM GEAR *Speed Reducers*

The Standards COLUMN

News of Interest to Manufacturers

Proposed American Standard for Letter Symbols for Gear Engineering

THOSE WHOSE JOB it is to analyze and make calculations for the durability and strength of gear teeth will welcome the news that a tentative draft of a proposed American standard for letter symbols in this field has been completed and printer's proof copies are available for free distribution on application to the A.S.M.E. Technical Committees Department.

This is the third standard to be formulated by the Sectional Committee on the Standardization of Gears, B6. The previous two are (1) Spur Gear Tooth Form and (2) Gear Materials and Blanks.

By action of Sectional Committee B6 the American Gear Manufacturers Association's committee on a given subject at a given time constitutes the nucleus of the corresponding subcommittee of the sectional committee, the remainder of its members being selected from the user or consumer group.

The A.G.M.A. has had a recommended practice for general gear nomenclature since 1926, in which letter symbols are included. At a meeting of the Association in Chicago, Ill., in October, 1941, the A.G.M.A. Committee on Nomenclature and Gear Geometry took definite steps leading to the preparation and publication of this proposed standard on letter symbols for gearing. In this work Subcommittee No. 3 has endeavored to follow closely the general principles laid down by the Sectional Committee on the Standardization of Letter Symbols and Abbreviations for Science and Engineering, Z10.

During the spring of 1942 copies of a proposed tentative draft of the standard were sent to the members of the committee together with a questionnaire covering certain details of the proposed list of symbols. The replies received to this inquiry prompted the preparation of a revised draft dated April, 1942 which was reviewed and tentatively approved at the May, 1942 convention of the A.G.M.A.

Copies of this proposal are now in the hands of a selected list of individuals for criticism and comment.

Personnel of Subcommittee No. 3 on Gearing Nomenclature

D. T. HAMILTON, *chairman*, Publicity Manager, The Fellows Gear Shaper Co., Springfield, Vt.
EARLE BUCKINGHAM, Prof., Department of Mechanical Engineering, Massachusetts Institute of Technology, Cambridge, Mass.
N. H. BYAM, Chicago Rawhide Manufacturing Co., Chicago, Ill.
A. H. CANDEE, Mechanical Engineer, Gleason Works, Rochester, N. Y.
GRANGER DAVENPORT, Research Engineer, Gould and Eberhardt, Irvington, N. J.
H. C. HESSE, Prof., Department of Engineering, University of Virginia, Charlottesville, Va.
O. A. LEUTWILER, Prof., Head of Mechanical Engineering Department, University of Illinois, Urbana, Ill.
A. W. LUCE, Prof., Head of Mechanical Engineering Department, University of Connecticut, Storrs, Conn.
L. D. MARTIN, Camera Works, Eastman Kodak Co., Rochester, N. Y.
F. A. MICKLE, Prof., Department of Mechanical Engineering, University of Michigan, Ann Arbor, Mich.
G. P. STAHL, The Stahl Gear and Machine Co., Cleveland, Ohio

For further information—address

The American Society of Mechanical Engineers
29 West 39th St., New York, N. Y.

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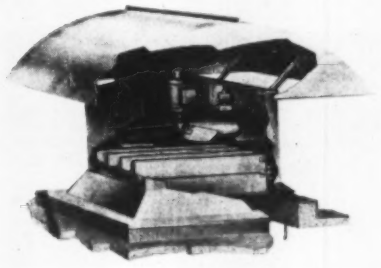
- *BUSINESS CHANGES*
- *LATEST CATALOGS*

Available literature may be secured by addressing a request to the Advertising Department of MECHANICAL ENGINEERING or by writing direct to the manufacturer and mentioning MECHANICAL ENGINEERING as a source.

• NEW EQUIPMENT

War Plant Ventilators

A new series of war plant ventilators for blackout and other factory buildings, is announced by Carrier Corp., Syracuse, New York, in a descriptive bulletin just issued.



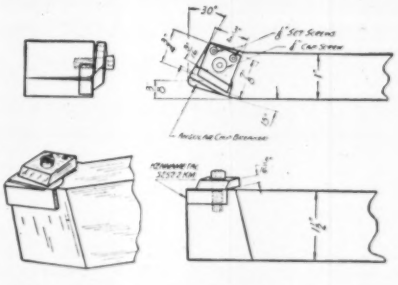
Designed to prevent transmission and reflection of illumination from the building interior or the reflection of light from the night sky, the Carrier War Plant Ventilators are available in three types as follows: (1) Carrier Exhaust Ventilators, to remove hot humid air from the plant, exhausting it at the roof; (2) Carrier Supply Ventilators, to replace the excessively hot plant air with relatively cooler air from outdoors, drawing the air in at the roof and supplying it with uniform circulation to the working areas; (3) Carrier Tempering Ventilators, which warm and deliver air to the plant, drawing the air in at the roof and providing the needed ventilation with tempered air to prevent drafts and cold spots in the plant during cold weather.

Each of the types described comes in three standard capacities—10,000; 15,000; and 20,000 Cfm. The units may be used singly or in multiple.

The bulletin (27 UST-1) illustrates the three types and presents description, specifications, dimension drawings and tables.

Clamped-On Carbide Tool Tips

Shops making up their own carbide cutting tools can greatly simplify the job and at the same time be assured of strain-free tools, by using a clamped-on tool.



A simple design which has been found very satisfactory is shown in the accompanying sketch. A tool shank is milled out, care being taken to get as flat a surface under the tip as possible, and a simple clamp attached. The SAE 1045 clamp is not used to break the chips as it would soon be eroded to destruction. Instead, a conventional chip breaker of angular shelf type is ground into the Kennametal tip.

Any danger of brazing strains is of course eliminated entirely, and grinding is greatly simplified since only the Kennametal is in contact with the grinding wheel, no steel to load up and glaze the special silicon carbide grit. One such SAE 1045 shank will serve to mount about four successive tips before it becomes cut and battered badly, and a harder steel would probably last even longer.

As the tip is reground, it is moved forward and out under the clamp, shims being placed behind it. When the tip becomes too small for service in this tool, it can frequently be brazed into a smaller shank for lighter turning operations or boring.

The freedom from strains due to unequal expansion of tip and shank makes a great difference in tool life, particularly on "home made" tools which are frequently made under widely varying conditions. In one plant, the use of clamped-on Kennametal tips made it possible to operate for months without a single case of serious tip breakage. Facts about Kennametal may be secured from McKenna Metals Co., 367 Lloyd Ave., Latrobe, Pa.

Taylor Aneroid Manometer

The absence of mercury or other liquid from this latest development of the Taylor Instrument Companies removes the possibility of product contamination and the hazard of mercury being blown due to line surges or carelessness. Further advantages are that sealing liquids are rarely required and vital mercury is released for the war effort.

Replacing the stuffing box is a new torque tube assembly which gives a completely closed system and is designed so as to eliminate friction and lubrication. This new assembly also does away with the lost time involved in maintenance. Friction, lost motion and wear are further reduced by the absence of internal pivots and springs.

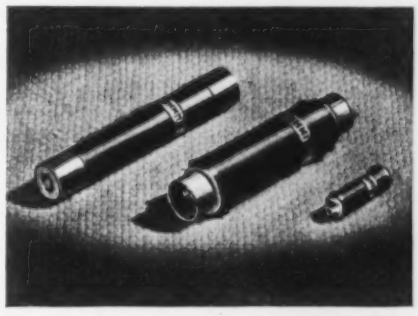
Metal bellows respond to the pressure variations and insure faster response under ordinary circumstances with immediate reaction to sudden changes in flow. The sturdy bellows are built to withstand high over-range without damage.

Under steady flow conditions the Taylor Aneroid Manometer is accurate within 1% of scale range. It is available for all types of indicating and recording meters and controllers and is supplied for standard ranges between 20 and 500 inches of water. The range can be changed right on the job by substituting precalibrated torque tubes.

For further information write the Taylor Instrument Companies, Rochester, N. Y.

Ohmite Ferrule Resistors

The Ohmite ferrule resistor has been designed for easy interchangeability without the use of tools. An even winding of resistance wire on a ceramic core is protected by an Ohmite vitreous enamel coating. The wire is terminated on metal bands or ferrules which permit mounting in fuse clips. Ferrules are cup, sleeve, or cartridge type.

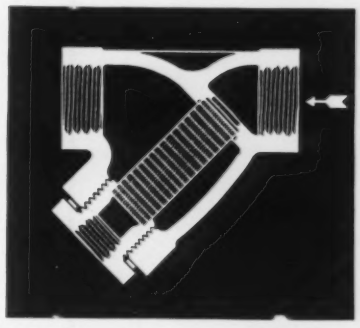


Special ceramic cores are available which, with special coating, will withstand the temperature shock test of repeated immersions alternately from ice cold water to hot water. Protective coatings which pass salt water immersion tests are also available.

The ferrule type of resistor is particularly applicable for use in the Navy, in the Signal Corps, on Army aircraft and on railroads. Units can be supplied in accordance with Navy specifications. Wide range of sizes.

For details write to Ohmite Manufacturing Company, 4835 Flournoy Street, Department 7A, Chicago, Illinois.

Yarway Fine-Screen Strainer



Yarnall-Waring Co., Chestnut Hill, Philadelphia, Pa. are manufacturing the Yarway Fine-screen Strainer shown above. Made in six standard sizes, 1/2" to 2", this

Continued on Page 23

An aid to better
spring design...

Information supplied by "Mechanical Engineering"

There exists a very evident need for the correlation of available data on mechanical springs, and for the formulation of a standard code for the design of helical springs. As a result, a group of specialists have made suggestions in a symposium, published in the July 1942 Transactions of the A.S.M.E. which it is hoped will crystallize into early action.

The scope of a proposed code, design stresses, the arrangement and scope of helical spring tables, the advantages and disadvantages of nomographic charts, and the future research needed on mechanical spring problems are all discussed in the symposium.

Serious attention to the problem of mechanical spring design began in 1924 with the establishment of the A.S.M.E. Research Committee on Mechanical Springs. Since that date, 66 papers on the subject have appeared in various A.S.M.E. publications. They have laid the groundwork for a design code which, when completed and adopted, should simplify the work of designers. The symposium contains a bibliography.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.
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strainer has three improved features: (1) plating inside and outside for protection against rusting, (2) screen of special Monel woven wire fine enough for straining service but having ample free area, (3) straight thread and machined face on blow-off bushing for easy removal and replacement of screen and for tight joint. Iron body for pressures up to 250 lbs., steel body for pressures up to 600 lbs. Also available in flanged-end design. Complete details in Bulletin S-200.

Bronze Bushings Chilled to 30° Below Zero

Chilling bronze bushings to 30° below zero is one of the many ways in which Carrier refrigeration equipment is helping to speed production in war plants.

Extending the tolerance without sacrificing the precision, the chilling process permits the machining to be done in a shorter time. Seasoning time for the casting is also reduced with the low temperature treatment. Castings no longer need lie exposed to outdoor sun and cold for several months, but can be machined soon after they come from the mold when the chilling process is used.

The tank, built with insulated walls and having a "refrigerator door" type cover, includes a cooling coil around the interior. The refrigerating machine, manufactured by Carrier Corp., Syracuse, N. Y., located adjacent to the tank, supplies the cooling effect to bring the liquid in the tank to minus 30°F. The liquid is a 50–50 mixture of an anti-freeze and water, the concentration of anti-freeze being selected so as not to freeze at the operating temperature of the chilling tank.

G-E Announces New Crater Filler

A new crater filler has been announced by the General Electric Co. for use with the G-E Strikeasy arc welder. The crater filler—a foot accelerator for welders—is designed to provide the very close auxiliary control of heat required in welding thin material, such as aircraft tubing, and to permit tapering off of the welding current at the end of a bead in order to fill the crater which is otherwise left. Unfilled craters have sometimes proved to be the source of cracks which are harmful to the strength of a weld. Properly filled craters provide full strength at the end of a weld bead.

The crater filler is essentially a combination of a foot-operated rheostat for reducing the current and a field forcing switch for providing a hot start or an increase in welding current when required. It is not intended to replace the function of the control on the Strikeasy, but is used to increase or decrease the heat setting to accommodate abnormal conditions at the beginning or end of a weld, or during a weld. Normal welding heats should be adjusted in the usual way.

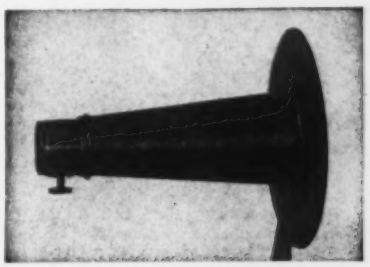
The crater filler is particularly helpful when working with thin material where normal welding heats are low, as conditions frequently arise where normal welding heats are insufficient. At the start of a weld the electrode and base material are cold and fusion might be poor, with consequent pile-up of the deposited metal. A similar circumstance arises where the section to be welded suddenly becomes thicker, or when it is necessary to weld into or across a previously deposited bead.

In either of these circumstances, the crater filler gives adequate fusion when needed. The increased current is instantly available and the return to normal heat is instantaneous.

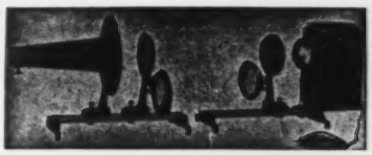
At the time of breaking the arc, the crater filler permits either a rapid or a slow decrease in current down to the point where

Continued on Page 24

The LENS *that assures* PRECISION



For either qualitative or quantitative photo-elastic analysis, perfection in the projection lens system is of major importance.



In our new model polariscopes of 4¼" & 6¼" clear aperture, the parallel beam is collected by a rear element and condensed through a three component lens of the Cooke system. In the new larger units (8¼" and 10" aperture) a four component lens of the Omnar system is used. In both cases, *the image is sharp throughout the field, free of aberration, astigmatism, and distortion.*

Literature of new model polariscope now available.

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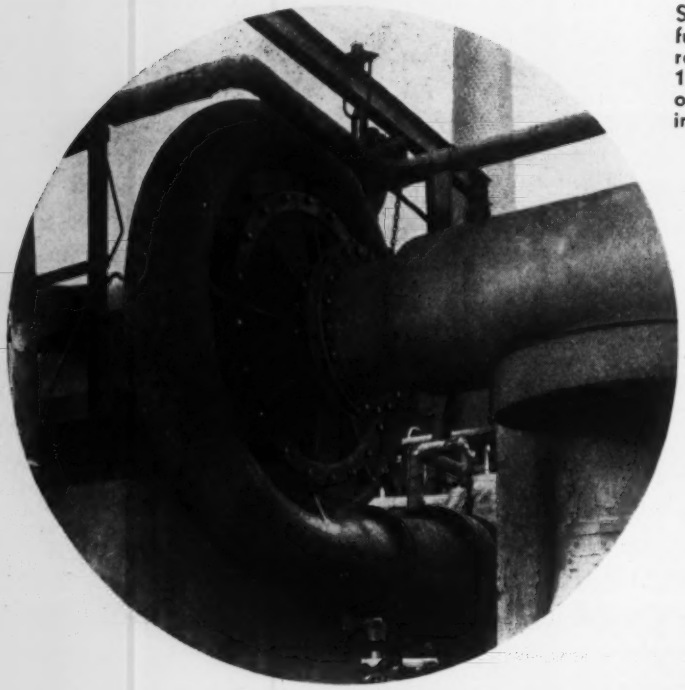

Single stage Centrifugal Blower in Eastern refinery. Capacity 11,750 CFM, 3 lbs. outlet and 14.3 lbs. inlet pressures.

BLOWER DESIGN
TO MEET YOUR REQUIREMENTS

If your air or gas handling problem is constant pressure with variable volumes, a Roots-Connersville Centrifugal Blower, with motor drive, may be the answer.

Specific service conditions may be corrosive gases, high temperatures, space limitations, adaptations to other equipment, etc. These factors call for specialized knowledge and experience to build a blower to suit your requirements. Scores of successful installations are proof of our ability to solve such problems for you.

Uncle Sam gets first call on all our products, but we will fill your essential needs with as little delay as possible.

ALL OUT for VICTORY

Roots CONNERSVILLE SINCE 1854 Centrifugal

BLOWERS · EXHAUSTERS

Single stage "R-C" units handle pressures up to 3 lbs. Multi-stage units up to 30 lbs. Capacities from 100 to 50,000 CFM.

ROOTS-CONNERSVILLE BLOWER CORPORATION

209 MICHIGAN AVENUE CONNERSVILLE, INDIANA

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the arc is extinguished. This assists the operator in mastering the technique of finishing a bead without a crater, because he can suit the rate of fading of the current to the conditions in that particular weld.

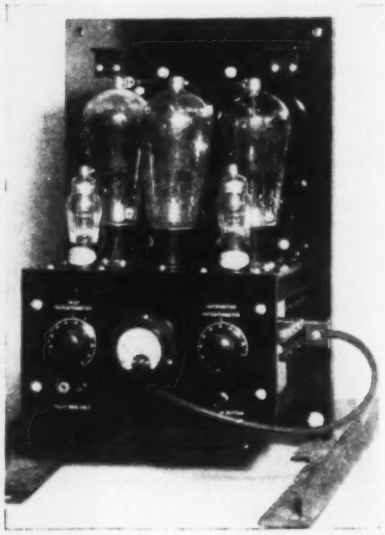
Transmitting Power Around a Corner

How to transmit power around a corner has been conquered by American ingenuity. Flexible shafting developed for American industry is finding even more uses in war production. The F. W. Stewart Corp., Chicago, Ill., one of the firms engaged in finding new uses for flexible shafts, is now busy with war orders for the army, the navy, and aviation. No angle, no position seems too difficult for their engineers to work out some way of achieving remote control. Airplanes, tanks, air-corps equipment and other war units are now using flexible shafting advantageously.

"After the war," says F. W. Stewart, president of this company, "American industry will be more conscious of the many uses of flexible shafts. You will see a tremendous increase in the use of remote control. The war is a great laboratory for American manufacture, and when peace comes the many new improvements such as flexible shafting will offer new opportunities for more and better ways of industrial work."

Electronic Voltage Regulator

The DT-5 electronic regulator for a-c and d-c generators is announced by the Westinghouse Electric & Manufacturing Co.



This voltage regulator is a sensitive electronic device which regulates the output voltage of a-c and d-c generators, providing the output voltage is more than 46 volts. The unit operates from a three phase a-c power supply and acts as a grid-controlled rectifier to supply the d-c field current to the generator, or the exciter of the generator, being regulated. Sensitivity is $\pm 1/4$ per cent when a-c supply voltage does not vary more than ± 5 per cent from nominal rating.

The regulator is built on a Micarta panel one inch thick and is designed for master panel mounting. No enclosing cabinet is provided but the tubes are protected by a screen cover.

Outstanding features of the DT-5 are low maintenance, reliability of operation and a high degree of regularity. An anti-hunt circuit is built into the regulator. This circuit prevents the regulator from overshooting when close regulation is required.

Additional information of the DT-5 electronic voltage regulator may be secured from department 7-N-20, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

Special Steel Conserves Nickel

Twenty thousand pounds of nickel—enough to make armor-plate for 55 medium tanks—will be conserved this year by the Westinghouse Electric & Manufacturing Co. through substitution of a newly developed steel for a nickel alloy in war-needed electronic equipment.

Hipersil steel—developed by Westinghouse originally for electric transformers—is now being used in place of a nickel alloy in the manufacture of Ignitrons, devices for converting a-c to d-c for manufacturing two vital war metals, aluminum and magnesium. Ignitrons also supply direct current for electric locomotives, steel mills, street cars, subway cars, printing plants and for spot welding.

In former years one part of the Ignitron equipment—the reactor—was made of an alloy containing about 50 per cent nickel. But when it became apparent that more and more nickel would be needed to make the steel alloy used in armor-plating tanks and battleships, Westinghouse started searching for a substitute material.

When Hipersil steel was tried, it performed as efficiently as the nickel alloy and turned out to be more satisfactory under changing temperature conditions. The magnetic properties of Hipersil steel are not materially affected by temperature changes, which range in the reactors from 70 to 200 degrees Fahrenheit.

A special silicon steel, Hipersil is produced by certain melting, heat treatment and rolling techniques that rearrange its crystals and improve its magnetic properties—a process that enables a small amount of Hipersil steel to do the job of a larger amount of ordinary electrical steel.

The process changes the crystals from random patterns to oriented or orderly structures, with the result that Hipersil steel carries one-third more magnetic flux or magnetism than ordinary steel. For example, an electromagnet made of Hipersil steel will do the same amount of work as an ordinary silicon steel magnet one-third larger.

Tests Under Temperamental Temperatures

Engineers operating a new "cold room" for testing radio parts—located in Kansas City—really have to be "quick change artists."

No sooner does the thermometer go soaring up to tropical jungle levels of 150 degrees or hotter, than it turns tail and goes skidding down to 40 below zero or thereabouts.

These temperamental temperatures are created to check the performance of precision radio parts under extreme conditions. Such equipment includes sound detection instruments for the Navy, delicate detectors for anti-aircraft use and similar apparatus which must stand up under the diverse climates of various parts of the globe.

Solution to the problem is the "cold room" which is an 8 by 12 foot room lined with eight inches of cork insulation in walls and floor, ten inches in the ceiling. Equipment supplied by Carrier Corp., Syracuse, N. Y. was used throughout to produce the maximum low temperatures of forty degrees below zero, and consists of a fifty-horsepower refrigerating compressor with a diffuser installed in the center roof panel of the room.

A boiler and humidifier to produce the high humidity needed to simulate Caribbean conditions are likewise used, with a battery of electric strip heaters to produce temperatures above 150 degrees in a few moments' time.

Equipment undergoing the test is put through the full range of temperatures and checked every ten degrees for operating efficiency, and has included radio equipment ranging from a large transmitter the size of a refrigerator down to microscopic electrical parts. Rubber-gasket pneumatic seals are used on the double door entrance through which all test equipment moves, and seal the "cold room" effectively against cold or heat leakage.

Period of test varied with the type of equipment being checked, ranging from an hour for some parts to eight hours for vastly important two-way sets for stratosphere bomber and fighter plane sets. Use of the cold room through this wide range of temperatures has developed several improvements in aerial radio manufacture, notably new insulation and the use of less contractile metals for vital electrical connections and wiring.

• BUSINESS CHANGES

75th Anniversary Observed by Keuffel & Esser

Too busy with the rush of war orders to celebrate its 75th anniversary, the firm of Keuffel & Esser, pioneer manufacturers of draughting materials, surveying equipment and fire control instruments for the Army and Navy, observed the occasion July 20 by presenting to each of its 2,200 employees a $25 war bond and a commemorative booklet entitled "Through the Years."

Only a brief pause between working shifts was taken to commemorate the company's 75th birthday. As the whistle blew ending the day's operations, some two thousand workers at the company's Hoboken factory gathered to hear Carl M. Bernegau, senior officer of the firm, briefly review its history and commend them for an outstanding production record which has twice brought the company the award of the Navy "E."

W. L. E. Keuffel, who heads the manufacturing operations of the company, also addressed the gathering and inducted twelve new members of a company organization known as the "Old Guard," a group of 124

Continued on Page 26

FOR MANY SERVICES THESE IRON BODY VALVES WILL SERVE AS WELL AS BRONZE

and with proper priorities, you are likely to get better deliveries

The availability of bronze valves is becoming an increasingly critical problem, because of the scarcity of copper, tin, and other vital materials necessary in their manufacture. We recommend consideration of these iron body patterns as alternates.

THE "KING-CLIP" — a sturdy iron body gate valve with internal working parts of bronze, for hard and continuous usage. It has wide application in industry and in many cases will serve as well as a bronze valve.

THE "FERRENEWO" — an iron body bronze mounted globe valve for numerous services. All parts are renewable and the seat and disc are easy to regrind. An excellent valve with low upkeep cost.

Since virtually all materials used in the manufacture of valves are on the list of critical materials, valve users are urged to furnish the highest possible preference ratings and proper "end use" Allocation Classification Symbols on their orders. This will be of mutual helpfulness.

ESTABLISHED 1862
THE LUNKENHEIMER CO.
"QUALITY"
CINCINNATI, OHIO, U. S. A.
NEW YORK CHICAGO
BOSTON PHILADELPHIA
EXPORT DEPT. 318-322 HUDSON ST., NEW YORK

LUNKENHEIMER VALVES

• Keep Informed

employees who have been with the firm for more than 25 years. Eight of these, including Messrs. Bernegau and Keuffel, constitute a group known as the "Golden Guard" who have served the company more than half a century, while two employees have the unique distinction of having been with the firm continuously for more than 60 years.

To serve manufacturing industries in various sections of the country, the firm maintains distributing branches in New York, Chicago, Detroit, St. Louis, San Francisco and Los Angeles, and in Montreal, Canada.

Five Westinghouse Plants Receive Joint Army-Navy Production Award

Selection of five Pennsylvania and New Jersey plants of the Westinghouse Electric & Manufacturing Co. to receive the new Army-Navy Award pennant "for high achievement in the production of war equipment" was announced by George H. Bucher, president of the Company.

Mr. Bucher was advised of the awards by James Forrestal, Under Secretary of the Navy, who pointed out that the men and women of these plants are making an outstanding contribution to victory. Their practical patriotism stands as an example to all Americans, and they have reason to be proud of the record they have set.

Westinghouse, now producing war equipment at the rate of $500,000,000 a year, is among the first companies to receive the joint recognition of the Army and Navy for exceptional performance on the production front, it was explained by the Navy which recommended that five of its first 43 joint Army-Navy Awards go to Westinghouse plants.

Presentation of the Westinghouse awards will be made by the Navy at the various plants between August 11 and September 10.

The plants thus honored are the Westinghouse Steam Division, South Philadelphia, Pa.; the Westinghouse East Pittsburgh Division, East Pittsburgh, Pa.; the Westinghouse Transformer Division, Sharon, Pa.; the Westinghouse District Manufacturing and Repair Plant, 30th Street, Philadelphia, Pa.; and the Company's District Manufacturing and Repair Plant, Newark, N. J.

The Westinghouse Electric Elevator Co., at Jersey City, N. J., previously was awarded the Navy "E" burgee with star, for excellence in production of Naval ordnance material.

These and other Westinghouse plants are producing 4,000 carloads of goods a month, enough to fill a freight train 37 miles long, Mr. Bucher disclosed. The Company is turning out ship propulsion apparatus, bomb fuses, gun mounts, aircraft controls and communication devices, and scores of other war products.

On a man-hour basis, Mr. Bucher said, Westinghouse production is 97 per cent ahead of the mid-1940 rate. In some manufacturing divisions production has been stepped up more than 300 per cent. "Today," he added, "the 88,000 Westinghouse employes are building only war materials, with the exception of some machines and parts needed to maintain essential civilian activities."

In acknowledging the official notice of the awards, Mr. Bucher stated:

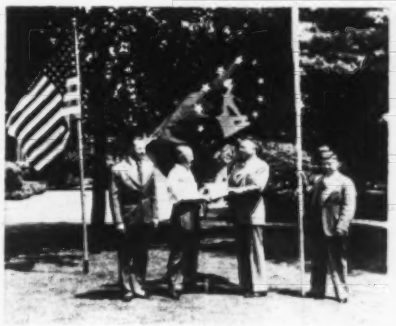
"We accept this honor not only as a reward for past efforts, but as a challenge to continue them with unwavering zeal until the war is past and victory ours."

The new Army-Navy Production Award supersedes the Navy "E" and the Army "A" awards which in the past have been

conferred separately on war production plants for efficiency and excellence of performance. It consists of a red and blue swallow-tailed pennant, to be flown above the selected plants, and lapel pins to be worn by employes of such plants. The flat is bordered in white and is centered by a white letter "E".

Symbolizing continued excellence in production, the flag is awarded only for six-month periods. To be retained by a plant, it must be re-won every six months.

Foxboro Company Awarded War Bond Honor Flag



The Foxboro Co., of Foxboro, Mass., makers of measuring and controlling instruments for industrial processes, was awarded the Minute Man flag of the Treasury Department, on July 8, in recognition of payroll allotment subscriptions by over 95% of its employees. The coveted flag and accompanying certificate were presented by Mr. Alfred C. Sheehy, Deputy State Administrator of the War Savings Staff for Massachusetts, and received by Mr. Irving W. Lane, second oldest employee of the Company. Arrangements were in charge of Mr. Corodon S. Fuller, (seen at the left in the photograph) an official of the Company and chairman of the War Savings Committee for Foxboro. He was assisted by Mr. Alfred Herschel (at right) of the Company's personnel department. The presentation followed a noon-hour concert by The Foxboro Company Brass Band.

G-E Legion of Quality Beating Schedule

The 5000 employees of the West Lynn Works of General Electric, who voluntarily enrolled as members of a Legion of Quality with the slogan of "42 per cent less spoilage in 1942," are 3.7 per cent ahead of schedule for the first six months, N. M. DuChemin, assistant works manager has announced.

"With critical war materials scarce and time saving most important in this battle to produce for victory, our workers are deserving of high praise for the fine record they have made so far this year," Mr. DuChemin said. "The bogey for the year is 42 per cent. That means a reduction in spoilage of 3.5 per cent each month. For the first six months the saving has been 24.7 per cent, as against a quota of 21.0, or 3.7 ahead of the goal. This saving in materials and time has already amounted to more than $300,000."

The "Legion of Quality" was organized by the employees in June, 1941. During the last six months of 1941, the reduction was 4 per cent, or a saving of about $11,000 per month. However, it was not until the first of the year that the campaign really got under way with its slogan of "42 per cent less spoilage for 1942."

Lobdell Changes Firm Name

Effective June 9, 1942 Lobdell Car Wheel Company amended its name to Lobdell Company. There is no change in the ownership or management of the company. The deletion of the words "Car Wheel" from the name is made to oviate confusion since the nature of the business has changed with the acquisition of the Nazel Engineering & Machine Works line of Forging Hammers and Slotting Machines.

The Lobdell Company are manufacturers of "Lobdell" Roll Grinding Machines, "Nazel" Electro Pneumatic Forging Hammers, and "Dill" Travelling Head Slotters. They specialize in Chilled Iron Rolls for Paper, Textile, Fibre, Paint and Oil Mills; Chilled Tread Car Wheels for Industrial Uses; Gray Iron and Chilled Iron Castings; and General Machining and Special Machinery.

Vast Plant Expansion Program for New Forge Company

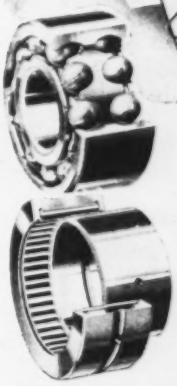
In announcing the formation of an associate company, the Kropp Forge Aviation Co., Mr. Roy A. Kropp, President of the Kropp Forge Company, 5301 West Roosevelt Road, Chicago, Ill., comments on the plant expansion program already underway.

A new plant is in the course of construction on property adjacent to the parent company and involves the construction of a modern high speed drop forging manufacturing plant almost equal in size to the present plant.

A considerable number of drop hammers ranging from 6,000 to 20,000 pounds capacity will be installed, together with dual furnace

Continued on Page 28

Tomorrow's Production Today



with McGILL PRECISION BEARINGS

To get TOMORROW'S production TODAY all machines building war material are pushed to their capacities. Many such plants are equipping vital machinery with McGILL "Solid-end" *MULTIROL* Bearings to increase efficiency, carry the heavier loads and eliminate shut-down time losses.

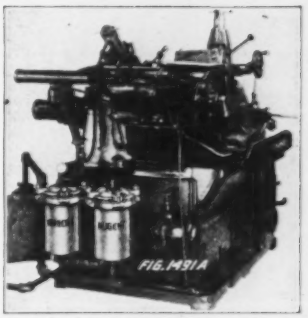
Bearing Division — 1100 North Lafayette St.

McGILL MANUFACTURING COMPANY, INC. VALPARAISO, INDIANA

★ ★ ★ ★ ★ ★ ★ ★ ★

CONSERVE

machine tool coolants and cutting oils! GET BETTER FINISHES!



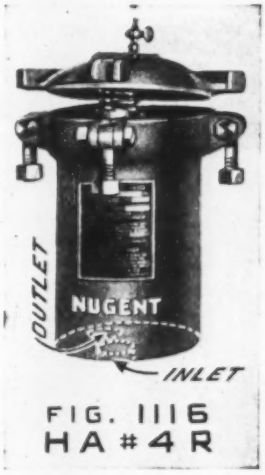


FIG. 1116 HA #4R

WAR measures demand that you utilize every possible ounce of coolants and cutting oils. One proved conservation method is to install a Nugent Filter on the machine tool itself, or as a separate portable unit. Their cost is quickly redeemed by the saving in operator's time, "down-time" required in regrinding tools and the smooth finish obtainable by keeping the oil completely free from dirt particles.

READ WHAT USER SAYS: Referring to the installation shown above, Union Special Machine Co., Chicago, writes "... after the installation of Two Nugent pressure filters (Fig. 1116 HA No. 4R), the problem of removing grit from the coolant compound used in our centerless grinders was completely eliminated . . . wheels now wear longer and a tremendous difference is noticed on the finish of the shafts, and particularly on the super-finish . . . because of longer wheel wear, better finish, and less frequent change of the coolant, a considerable savings has been effected."

Nugent offers a complete line of filters for every purpose. Write today for information.

NUGENT TRADE MARK

WM. W. NUGENT & CO., INC.
(Established 1897)
407 N. Hermitage Ave. Chicago

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

Use NUGENT FILTERS

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

equipment for each hammer, trimming presses and straightening or coining presses, as required, for the manufacturing of accurate drop forged machine and equipment parts.

A feature of the new plant will be the mechanical handling of raw materials, finished parts and scrap. Provision for the out-loading of scrap directly into railroad cars for immediate return to the mills is being made to facilitate the daily return of flashing, butt ends and other forging scrap.

The new plant is designed for flo-line production of drop forgings with crane and conveyor systems handling billets and bars from cars to heating furnaces, to hammers, to machine shop, sand blast, pickling or heat treating and inspection and on to trucks or railroad cars for out-shipping.

Mr. L. B. Walton, designing engineer, of the Central States Architects and Engineers who laid out the new plant, says: "The Japanazis will have plenty more to worry about when this plant, to be completed before the end of the year, is hammering out forgings for plane and armament makers throughout the United States."

"The production tonnage of the new plant will be approximately four times the company's existing drop forging production, but through the broad use of labor serving equipment the manpower requirements of the new addition will be only two and one-half times that of existing operations."

All heating and heat treating operations will be under complete laboratory control. A modern laboratory for making complete chemical and metallurgical determinations and photo-micrograph studies of test bars is now nearing the point of completion.

The latest types of inspection equipment will be employed for making surface determinations, including a new luminous Magnaflux department.

Designed for greatly increasing the company's output of forged armament parts for guns, ships, tanks, ordnance and aviation equipment, this new plant promises to be one of the highest production drop forging plants of its kind anywhere.

Roy A. Kropp, company president, pointed out that the forging bottleneck will be broken for many manufacturers when these new facilities go into production as the company serves manufacturers from coast to coast with essential drop forged parts. He said, "We'll keep 'em hammering to keep 'em floating, flying, rolling and shooting!"

Timken Advertising Department Promotions

The following promotions in the publicity and advertising department of The Timken Roller Bearing Co., Canton, Ohio, were announced today by Roland P. Kelley, Director of Advertising and Sales Promotion.

Worthing H. Stone becomes Assistant Advertising Manager and is to be in charge of advertising for the Railroad, Farm Implement, Automotive and Rock Bit Divisions of the Company. A graduate of Oberlin College, Stone came with the Company in 1936 as manager of the Timken Roller Bearing Exhibit at the Great Lakes Exposition in Cleveland, after which he became associated with the Company's sales promotion work, specializing in the supplying of cooperative information both to Timken customers and to general industry.

S. L. Huffman, a member of the advertising staff for several years, has been advanced to Manager of the News Bureau where he will be responsible both for general publicity and technical articles for the industrial press, in addition to continuing his present duties of handling the advertising of the Steel and Tube Division. Huffman graduated from Marion College in 1929 and after taking graduate work in Science at Indiana University spent several years in newspaper work, joining the Timken organization in 1939.

Peter C. Poss continues his present activities as Assistant Advertising Manager, supervising the buying of publication space and printing; and in addition will take over the publishing of technical information for the engineering fraternity, an activity which the Company plans to expand considerably in cooperation with the war effort.

New Hays Representatives

The Hays Corporation, 975 Shirl Ave., Michigan City, Indiana manufacturers of combustion instruments and control, announces the appointment of the Energy Control Co. in Philadelphia, succeeding the Paul B. Huyette Co., Inc. The Energy Control Co., J. T. Vollbrecht, President, has represented The Hays Corporation in the New York territory for the past several years. The Philadelphia territory comprises the eastern half of the state of Pennsylvania, all of Delaware and portions of Maryland, New Jersey, Virginia and West Virginia. Headquarters have been established at 3107 North Broad Street, and Mr. Lee Myers, formerly of The American Engineering Co., will be associated with Mr. Vollbrecht.

Announcement is also made of the appointment of Engineering Products Co., Mr. F. E. Anderson, Manager, to the Southern West Virginia field with headquarters at Charleston, 304 Davidson Building. Associated with Mr. Anderson is a well rounded group of engineers, qualified to render competent service in boiler room instrumentation and control.

The third appointment made recently was that of the Power Specialty Co., O. W. Muller, Manager, with headquarters at Houston, Texas, 25 North Live Oak Street, the territory covering Southeastern Texas.

McKnight New Detroit Manager for Allegheny Ludlum

J. D. McKnight has been named Manager of Allegheny Ludlum's Detroit district sales office, according to R. M. Allen, the company's general sales manager. Formerly Assistant Manager in Detroit, Mr. McKnight has been associated with Allegheny Ludlum for the past six years, following his previous connection with the Murray Corporation of America, Detroit, in various plant and sales capacities.

The move is now in effect, and follows the transfer of Allegheny Ludlum's former Detroit Branch Manager, H. N. Arbuthnot, to the Pittsburgh offices of the company as assistant general sales manager.

Cochrane Appoints in Philadelphia

Cochrane Corp., Philadelphia, Pa., announces the appointment of the Energy Control Co. as flow meter representative for eastern Pennsylvania, southern New Jersey, Delaware and Maryland. Energy Control Co. is located at 3107 No. Broad Street, Philadelphia, and will also handle Hays combustion control and instruments and the Heacon damper.

Energy Control Co. also represent these lines in New York City and vicinity, includ-

HAVE YOU A PROBLEM
Where Increased Load Carrying
Capacity in the Lubricant
May Prove to be the Answer?

USE "STURACO" ★★★★ EXTREME PRESSURE ("EP")
MACHINERY OILS & GREASES

• Here is the answer to many of your lubrication problems caused by today's production demand of heavy loads, high speeds, and continuous operation of machinery and machine tools. "Sturaco" EP Oils and Greases, without any change in your accustomed viscosity or consistency, offer a minimum of 300% increased load carrying capacity with notable low torque.

Lubrication of ways — spindle bearings — gear heads — elevating screws — speed reducers — are typical examples where "Sturaco" application has solved tough lubrication problems. If you need help, write or phone today.

• • •

SEND FOR the new "Sturaco" booklet outlining laboratory research behind this genuine development, describing typical applications and listing various grades.

For All Cutting Fluid Problems
D. A. STUART OIL CO.
Chicago, U.S.A. • LIMITED • Est. 1865
Warehouses in All Principal Metal Working Centers

• Keep Informed

ing western Connecticut and northern New Jersey. The company is headed by J. T. Vollbrecht whose twenty years' experience with industrial instrumentation give him a unique background of training and experience. His Philadelphia associate, C. L. Myers, likewise has had many years in power plant and process engineering work. William Ruglass is in charge of the Philadelphia office staff, with the service division headed by Ralph Kimball, well trained by twelve years as instrument engineer for a large refining company.

Robert H. Morse, Jr. Now Fairbanks-Morse Assistant Sales Manager

Robert H. Morse, Jr., who has been branch manager successively of Fairbanks, Morse & Company's offices at Cincinnati, Dallas and Boston, has recently taken his position as Assistant Sales Manager with A. C. Dodge, Vice President and Sales Manager, Fairbanks, Morse & Co., Chicago, Illinois.

John Elmburg, formerly Manager of the Diesel Engine Department at St. Paul, Minnesota, has been made Manager of the Boston Branch to fill the vacancy left by Mr. Morse.

Stevens Elected Norma-Hoffmann Vice-President

Norma-Hoffmann Bearings Corporation, Stamford, Conn., announces that at a meeting of its Board of Directors, Clarence E. Stevens was elected Vice-President in charge of Plant Operations, assuming his duties on August 15th, 1942.

Mr. Stevens was, until April 1st, 1942, Vice-President in charge of Manufacturing of Electrolux, Incorporated (manufacturers of vacuum cleaners) at Old Greenwich, Conn. He succeeds Charles B. Malone who resigned on July 31st to become associated with another industrial business in Stamford.

Increasing Our Own Production: Helping Others

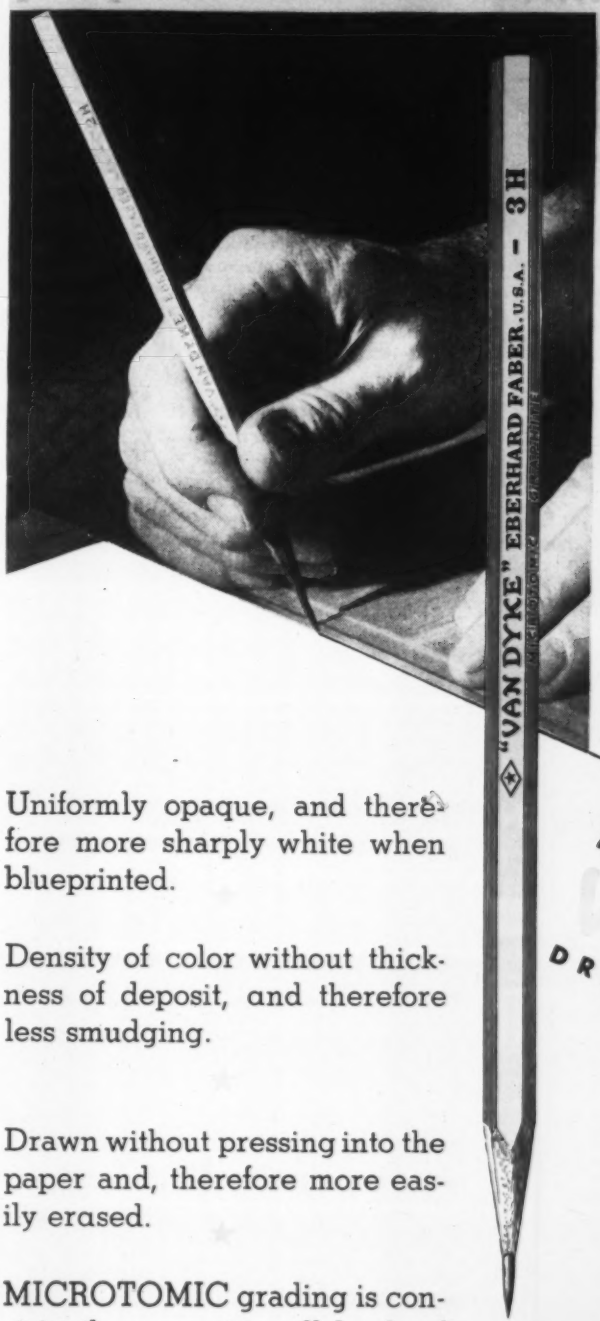
Early in 1940, Allegheny Ludlum Steel Corp., Pittsburgh, Pa., began the expenditure of several million dollars in an expansion and modernization program at all of its own mills and those of its subsidiary companies. New electric furnace capacity and finishing mill equipment were installed; existing production facilities were streamlined to step up output. Although improvements are still going on in each of the company's mills, the major units in the initial expansion program were completed by mid-1941, more than a year ago, and results are now in evidence.

While 1940 production had set a new high mark for the company, its 1941 shipments were a full third greater. Average monthly value of Allegheny Ludlum's shipments of its special steels in 1941 was $7\frac{1}{2}$ million dollars; but by July, 1942, shipments had been boosted to $9\frac{1}{4}$ million dollars monthly, for a further increase of 23% over the 1941 average in only 7 months time. Special "War Production" drives, either very recently or currently going into effect in the company's mills, are expected to push this increase higher before the end of 1942. For months past, of course, the company had been 100% on war work.

Shifts in management have been made, and additional top executives created, to match the upward surge of Allegheny Ludlum output. All plants in the Pittsburgh area were placed under unified management in late 1940. In early 1941, a new Development Engineering Department was created, followed shortly by a special Scrap

Continued on Page 30

HI-DENSITY LINE



The Draftsman's ready answer to war-emphasized insistance on

MORE BLUEPRINTABLE TRACINGS

Drawn with the **HI-DENSITY LEAD** of the modern **MICROTOMIC DRAWING PENCILS**

Uniformly opaque, and therefore more sharply white when blueprinted.

Density of color without thickness of deposit, and therefore less smudging.

Drawn without pressing into the paper and, therefore more easily erased.

MICROTOMIC grading is consistently accurate—all leads of the same degree are always identical.

Hi-density of lead structure:—therefore stronger points and notably longer wear.

TRY THIS UP-TO-THE-MINUTE MEANS OF LIGHTENING THE LOAD FOR THE MAN AT THE BOARD **Free**

EBERHARD FABER PENCIL CO.
37 Greenpoint Ave., Brooklyn, N.Y.

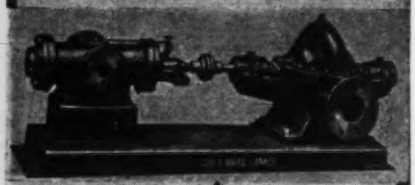
I'd like to test your MICROTOMIC VAN DYKE with the Hi-Density lead.
Please send one as indicated below:

.....degree, round lead (choice of 18 degrees)
or.....degree, chisel shaped lead (6H, 4H, 2H, HB, 2B, or 4B)

NAME
NAME OF COMPANY TITLE
STREET AND NUMBER
CITY AND STATE

THE EBERHARD FABER DRAWING PENCIL WITH THE MICROTOMIC LEAD 18 DEGREES ... AND 6 DEGREES WITH CHISEL POINT LEADS

NO SPEED LIMIT



for IMO

The DE LAVAL-IMO rotary displacement OIL PUMP operates at standard motor or turbine speeds. The pump here shown is driven by a high-speed water turbine. The three moving parts of an IMO pump are in perfect rotational balance. There are no valves and no gears and there is only one stuffing box, which is subject to suction pressure only. Any kind of oil is pumped in any volume and against any pressure.

Ask for Publication 1-98.

IMO PUMP DIVISION
of the De Laval Steam Turbine Company
Trenton, New Jersey

• Keep Informed . . .

and Salvage Department—both undertaking highly essential liaison work with war industries in their respective fields.

In addition to the expansion of its own production and services, Allegheny Ludlum has paid considerable attention to assisting users in making greater capital of its products, through the medium of newly created printed material and moving pictures, amplified by the activities of its house magazine, Steel Horizons, and by informational lecture tours arranged for a number of the company's metallurgists and technical experts. This work is currently being accelerated.

Midwest Ordance Chief Lauds Industry Effort In Armament Production

Minneapolis, Aug. 18—Production of as many tanks and tractors in two weeks by manufacturers in the Chicago Ordnance District as in the entire two years of America's participation in the last World War was reported today by Brig. Gen. Donald Armstrong, who presented the district's first Army-Navy "E" to the Minneapolis-Honeywell Regulator Company plant here.

Declaring that victories of production are necessary before the United States can stop the succession of defeats in the field, Gen. Armstrong said: "Minneapolis-Honeywell has produced far in excess of what we in the Army anticipated."

In accepting the "E," Harold W. Sweatt, company president, said that it represented a challenge to back up the fighting forces, and he pledged that the employes of his company will be able to look the returning soldiers "in the eye and know that through no deeds of ours have we ever let them down."

The company, it was stated, is turning out precision and control equipment for the Army and Navy, including both aviation branches.

Speaking at the award ceremony, Governor Stassen told the gathering of 5,000 that "American industry and agriculture are already demonstrating that we can outproduce the enemy. And we will show," he asserted, "that free men, who love peace most, fight the hardest when they must."

Gen. Armstrong, who has just been appointed head of the newly organized automotive ordnance division in Detroit, termed the award a military decoration to management and employes, "just as those given to men in the field."

With thousands of American boys now paying the penalty for peacetime lulls in preparedness by being prisoners in Japan and elsewhere, he declared, "an all out victory in industry is necessary before we can expect to see victory by our armed forces."

• LATEST CATALOGS

Electronic Control for Resistance Welding

A new 38-page illustrated booklet, giving a simplified explanation of electronic control for resistance welding, pointing out the different kinds of resistance welding that can be done, the function of the various controls and the degree of accuracy made possible by electronic control, is announced by the Westinghouse Electric & Manufacturing Co.

The various types of electronic control for resistance welding are illustrated and described. The booklet also explains what it is, what it does, and where and how it is applied. Also included in the same publication are three pages of application data on the choice and application of a-c single phase resistance welding control; an eight-page bulletin on fundamental electronic circuits; and a discussion of the cathode ray oscilloscope and its application to welding timers.

The heart of all these resistance welding controls is the ignitron tube. The development of this tube answered the long standing problem of satisfactorily interrupting high currents at speeds of 600 operations per minute and above. Its extreme precision and dependability make possible increased production of stronger, more uniform welds of aluminum and other critical alloys.

A copy of booklet B-3102 "Westinghouse Electronic Control for Resistance Welding" may be secured from any Westinghouse District Office.

High-Accuracy Flowmeter

"Centrimax Flowmeter for Steam and Water" is described in a new 20-page catalog by Leeds & Northrup Co.

The man who needs to measure flow with better than usual accuracy—either because power efficiency is at stake, or because accounting is done on the basis of flow readings—will find the solution to his problem in the Centrimax Flowmeter. He'll find, as growing numbers of users have found, that the first cost of this fine meter is more than justified by its exceptionally high accuracy even at part load, and by its outstanding reliability and freedom from maintenance.

OHMITE Rheostats

Insure Smooth, Close Control...

● In actual performance, Ohmite Rheostats have been operated over a million times without servicing of any kind. It's the design, the construction, that makes them so dependable for electrical control of motor speed and generator fields, of light and air conditioning equipment, of welding machines and electrical apparatus, of communications and electronic devices. Ten sizes from 25 to 1000 watts, in straight or tapered windings, in single or tandem assemblies, in stock or special units to meet every need. Rheostats produced to Government specifications or engineered for you.

OHMITE MANUFACTURING CO.
4809 Flournoy Street Chicago, U. S. A.

BE RIGHT WITH ★ OHMITE
Rheostats · Resistors
Tap Switches

Write on company letterhead for 96-page Industrial Catalog and Engineering Manual No. 40.

• Keep Informed

In central stations and industrial power plants, Centrimax pays for itself quickly by helping maintain maximum efficiencies through greater accuracy in measurements of steam and water flow. And where operating or customers' accounts are charged on the basis of flow readings, both producer and purchasers of process steam find that Centrimax accuracy pays. Industrial plants often find this accuracy equally important in metering other process fluids.

Anyone who wishes to receive a copy may do so by asking Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia, Pa., for Catalog N-28-160.

Application of Centrifugal Pumps

The proper application of centrifugal pumps presupposes an understanding of their limitations and potentialities, and knowledge of how pump characteristics are affected by features of design should, therefore, be of interest to pump users. An elementary analysis of centrifugal pump performance is presented in an article by H. Gartmann, which has been reprinted and is being distributed gratis by the De Laval Steam Turbine Co., Trenton, New Jersey. The influence of blade angles and of the areas of wheel passages upon the head-capacity curve is explained by means of simple diagrams, and it is shown how, once the characteristic curves of a given pump at a certain speed are known, it is possible to predict delivery, head and power requirements and efficiency at a different speed.

South Bend 16″ Precision Lathes

Catalog No. 16, describing South Bend 16″ Precision Lathes, has just been issued by the manufacturer.

This 8-page, file-size catalog completely illustrates and describes South Bend 16″ Toolroom Lathes and 16″ Quick Change Gear Lathes. Attachments, accessories and tools for use with these lathes are also listed.

Construction features of the lathes are illustrated. Specifications are tabulated for ready reference. These lathes have $16\frac{1}{4}$″ swing, 1″ collet capacity, and are made in several bed lengths providing between-centers capacities from $33\frac{1}{2}$″ to $105\frac{1}{2}$″.

For copy of Catalog No. 16 write to South Bend Lathe Works, Dept. 6M, South Bend, Indiana.

Grinding Cutter Bits

An informative 12-page booklet on grinding lathe tool cutter bits. Covers the identification and application of the various cutter bits; methods of grinding; correct angles for grinding the various types of tools and for machining various materials. Price 10¢. Sample copy of this bulletin (no. 35) free upon request to shop superintendents and apprentice supervisors. South Bend Lathe Works, South Bend, Indiana.

Cutting Screw Threads

"How to Cut Screw Threads in the Lathe," a 21-page booklet covering the cutting of screw threads on back-geared screw-cutting lathes has just been reprinted by the South Bend Lathe Works. The first portion of the book is devoted to the setting up of a lathe for thread cutting. This includes use of quick change gear box to obtain the pitch of thread desired.

Complete information is given on the various types of lathe tools employed in cutting screw threads, how to grind them, and how they should be mounted and positioned. The uses of the center gauge, compound rest, thread cutting stop, thread dial

Continued on Page 32

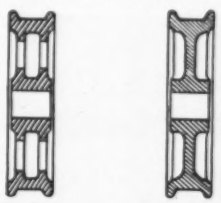
Double-Wall Design of Crane Wheel *Assures Safety and Long Life*

Manganese steel crane wheels of ordinary single web design have repeatedly chalked up superior service records over single wall crane wheels of ordinary iron or steel. The ability of 13% manganese steel, while surface-hardening under pressure and friction, to retain a tough internal structure reduces the incidence of cracking of the treads and fractures in the web at flanges or hub.

These advantages of manganese steel plus "Double-Wall" design, developed by Amsco, present an unsurpassed combination for maximum service life and greatest safety.

Users have reported that besides the longer service life of the wheel the rails also last longer. This reflects the fact that manganese steel wheels take on a polish from friction, whereas ordinary wheels, being relatively brittle, develop minute surface cracks in the tread which tend to abrade the rails.

An examination of a cross-sectional drawing of single and Double-Wall crane wheels brings out the structural superiority of the latter. The greater overall strength and the more rigid support given the wheel rim and hub are obvious.



Double Wall — Single Wall

The cut-away view of the Amsco Double-Wall crane wheel shows the flanges continuous with the walls (A) affording high resistance to side thrusts. The walls are internally connected by cross-members (B) from the hub to the inside circumference of the rim, thus assuring a strong support for the tread as well as a rigid tie for the walls.

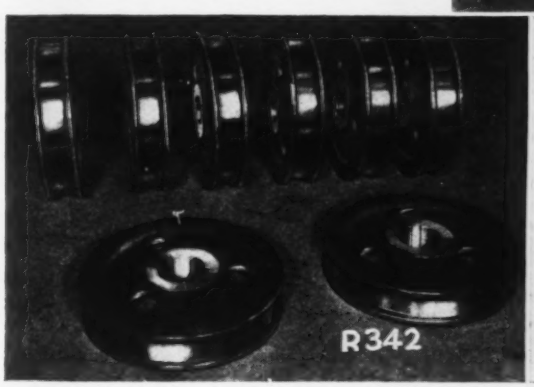
A foundry organization that could make its own wheels stated:

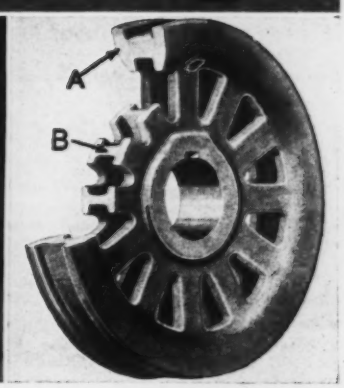
"*We have referred your letter of January 29 regarding performance of manganese steel track wheels to our factory who advise us that manganese steel crane wheels have been found superior to cast iron chilled wheels. The Amsco wheels wear evenly and there is no web breakage.*"

A car builder reports over 20 years service from the original lot of their design of double-wall crane wheels, shown (R342) which operate under very hard and almost continuous service. Two 24″ wheels of Amsco design are also shown (R259).

Their long service life, conserving vital metal, and their wide safety factor, protecting crane operators and workers from hazards, recommend the use of Amsco Double-Wall crane wheels in war production plants.

Send for crane wheel questionnaire which simplifies quotations.





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Chicago Heights, Illinois

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indicator, taps, dies, etc., are explained. Types of screw threads commonly used are fully described with formulae and diagrams of standard screw thread forms.

This booklet (Bulletin No. 36-A) is priced at 10c a copy, postpaid, and can be obtained from the South Bend Lathe Works, Dept. 6M, South Bend, Indiana.

New Ampco-Trode 10 Bulletin

Ampco Metal, Inc., Milwaukee, Wis., have just released a new six-page bulletin, letter-head size, describing in detail Ampco-Trode 10, an all-purpose, coated bronze electrode.

The new bulletin contains physical properties, chemical composition and procedures for various types of welding using the new electrode. One of the major applications for Ampco-Trode 10 will be the metallic arc welding of cast manganese bronze, Muntz metal, and brass. Detailed instructions are given for using Ampco-Trode 10 on these or similar metals. The bulletin is illustrated by a number of diagrams showing methods of welding, deep groove preparation, building up metal on vertical surfaces, weaving sequence, and method of depositing beads.

The bulletin is issued as a supplement to the Ampco-Trode Weldrod Bulletin, and a copy will be sent to welding engineers on request.

New Ampco Aircraft Bulletin

"How Aircraft Designing Engineers Use Ampco Metal" is an 8-page, letterhead-size bulletin, being distributed by Ampco Metal, Inc., Milwaukee, Wisconsin, producer of Ampco Metal and other bronze alloys. The booklet describes pictorially the use of Ampco Metal by the aircraft industry. Printed in two colors, it is well illustrated with photographs of a wide variety of aircraft and equipment. Copies of the new bulletin will be sent to interested engineers.

Welding Fittings

A complete new 240-page Welding Fitting Catalog and Engineering Data Book No. 111. Divider pages and thumb indexes make it exceptionally easy to find dimensions, list prices and a wealth of other information on the complete Tube Turn line of welding fittings and forged steel flanges, plus essential and exclusive engineering data. Tube Turns, Louisville, Ky.

Wall Chart Offered by Elastic Stop Nut

A wall chart, explaining the uses of its various types of self-locking nuts, is being distributed by Elastic Stop Nut Corp., Union, New Jersey, to engineering departments, drafting rooms, maintenance shops, and schools.

The center of the chart is devoted to an illustrated description of the basic principle by which a self-locking action is obtained in all Elastic Stop Nuts, regardless of type. This is followed by illustrations of some of the advantages to be obtained by the use of the nuts and, completing the presentation, there are cross-section drawings showing the method of application of the nine types most generally used, with corresponding photographs of these types.

The chart measures 21 by 27 inches and is reinforced at top and bottom by metal strips, with an eyelet for hanging. Copies can be obtained by writing to the manufacturer.

Condensed Catalog of Carrier Products

Newest edition of the condensed catalog for industry listing various products of Carrier Corp., Syracuse, N. Y. world's largest maker of air conditioning equipment, is now being distributed.

A new and novel feature of the contents is a table giving a partial listing of the many war industries served by Carrier. Included in this group are manufacturers of aircraft, ammunition, chemicals, precision instruments, drugs, films, steel, synthetic textiles and rubber.

Another section groups the Carrier products according to their functional classification and then lists those industries requiring the different types of installations. The functional breakdown includes four classifications of equipment—that devoted to temperature and humidity control, refrigeration, heating and special applications.

This chart is accompanied by an index which enables one seeking information to determine immediately what section of the text pertains to his problem.

The data in the main section of the catalog provides the industrial engineer with specifications, dimensions, weights, etc., enabling him to decide on the best type of equipment for his particular situation. Illustrations of each unit are also included.

The Carrier book is being circulated to 1,800 industrial engineers throughout the country. The catalog was styled so as to be of particular aid to those carrying on war work, which comprises more than 99 per cent of Carrier's current orders.

Heat Transfer Through Metallic Walls

Processing equipment is rarely designed without careful consideration of the overall heat transfer rates that may be anticipated as a result of conductivity through metal walls. Since the thermal conductivities of the metals used in the fabrication of steam chests, condensers, and jacketed units are, of themselves, poor indices of what may actually be expected, considerably more information is desirable to insure successful design.

A 16-page booklet from data prepared by the Development & Research Division of the International Nickel Co., includes information in formulae for determining overall heat transfer rates, the various factors influencing heat transfer through metallic walls, and the thermal conductivities of metals and alloys commonly used in the construction of process equipment.

To the original data there has been added a number of illustrations showing several types of equipment which are characteristic of process units that depend on the transfer of heat through metallic walls for normal operations.

Copies of this booklet may be secured by writing to The International Nickel Company, 67 Wall St., New York, N. Y.

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COMING MEETINGS AND EXPOSITIONS

For the next two months

OCTOBER

12–14 The American Society of Mechanical Engineers, 1942 Fall Meeting, Hotel Sagamore, Rochester, N. Y.

12–15 American Welding Society, Annual Meeting, Hotel Cleveland, Cleveland, O.

12–16 American Society for Metals, National Metal Congress and Exposition, Cleveland Public Auditorium, Cleveland, O.

15–17 American Society of Tool Engineers, Semi-Annual Meeting, Springfield, Mass.

27, 28, 29 National Safety Council, 31st National Safety Congress and Exposition, Hotel Sherman, Chicago, Ill.

NOVEMBER

9–13 American Petroleum Institute, 23rd Annual Meeting, Palmer House, Chicago, Ill.

11–14 Society of Naval Architects and Marine Engineers, 50th Annual Meeting, Waldorf-Astoria, New York, N. Y.

16–18 American Institute of Chemical Engineers, 35th Annual Meeting, Netherland Plaza, Cincinnati, Ohio

30—Dec. 2 American Society of Agricultural Engineers, Fall Meeting, Chicago, Ill.

30—Dec. 4 The American Society of Mechanical Engineers, 63rd Annual Meeting, Hotel Astor, New York, N. Y.

For Calendar of coming A.S.M.E. Meetings see page 692 in the editorial section.

How a Transparent Duplicate

HELPED MOVE a Factory...

A LEADING MANUFACTURER wanted to move into a more desirable building—but hesitated when he saw estimates of the time which would elapse before he could begin production.

Ozalid then showed how five hundred hours could be saved in drafting time alone! First, instead of making multiple drawings of the master floor plans—Ozalid transparent duplicates were quickly made. The draftsman then added—direct to the duplicates—the plans for machinery layout, ventilating and heating, transmission and beltings, electrical and plumbing connections, etc. These duplicates were used to produce the desired number of work prints. Thus, in changing over . . . time and labor were saved.

Today, many manufacturers are reorganizing factories and assembly lines . . . making frequent changes in product design. And the Ozalid Process is giving them a "head start" in vital war production. An Ozalid whiteprint machine turns out standard and transparent prints in two quick steps—Exposure and Dry Development . . . without the wasteful tie-ups which are a part of "wet" developing methods. And Ozalid's wide variety of sensitized materials allow you to: cut drafting time . . . speed the making of corrections . . . turn out whiteprints which will have the most "back bone" in the busy shop or sun-baked field.

Write for new catalog. See how the Ozalid Process can help you!

BASIC FACTS ABOUT PRINT MAKING YOU SHOULD KNOW

OZALID TRANSPARENT FOILS ARE USED TO MAKE COMPOSITE PRINTS—The extreme transparency of Ozalid foil allows using multiple layers at one time to make a composite print. Thus, if you have separate details—each on a different foil—which you want brought together in one print, merely place the foils, one on the other, and feed with a piece of Ozalid sensitized material into the whiteprint machine.

Consequently, you can make prints which will show such details as plumbing and heating, power and pipe lines, etc., either separately or combined.

Foil copies of original drawings are made the same as standard whiteprints.

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OZALID PRODUCTS DIVISION
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What Is Our Most Dangerous *DANGER?*

The danger we as a Nation need to fear is not merely the danger of financial weakness. Far more devastating, at this time, would be a weakening of the *Spirit of Freedom*.

The Spirit of Freedom is a *fighting* spirit.

In our country the spirit of Freedom reaches to Free Enterprise. And in *our* country Free enterprise has advanced to unmatched heights because Free enterprise has some understanding of the forces that are essential for utmost attainment.

Those forces include the people as a whole . . their spirit, their aspirations, their skills and their appreciation of *their rights* under the Constitution.

Free enterprise has given us the physical means of defending and extending those rights. They are mass production, plus new and improved design.

Mass production and improved design are the big tools which enable Free men and women on the production front to produce effective equipment in overwhelming quantities for the Free and brave men on the fighting fronts.

To make the equipment in overwhelming quantities calls for cooperation. To make it victoriously effective calls for enough of the right equipment at the right place at the right time.

And so the War Production Board has welcomed the aid of THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS . . whose far-reaching cooperative activities, backed by 63 years of development, are now geared directly to the *war needs* of the Nation.

JOHNSON CITY, N.Y.
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And ships are a primary need of the day—fighting ships, troop transports, supply ships, tankers and other craft for use on inland waterways, in coastal service and in the inter-continental hauling of vast quantities of men and materials.

We're beating plow shares into swords 168 hours a week making rugged, stress resisting ship forgings for stem and stern, fighting tower and keel, and a thousand places in between.

While our facilities are crowded, we still want to serve more ship, tank, plane, gun, ordnance and machine tool builders. We'll stretch our production capacity, burn more midnight oil, do the impossible to assure rapid, intelligent handling of their forging needs.

It is our fervent desire to speed the day when free men can again travel the high seas, engage in free enterprise and follow the normal pursuits of industry.

Proudly we fly the Navy "E" flag awarded for excellence and proficiency in the production of Naval materiel.

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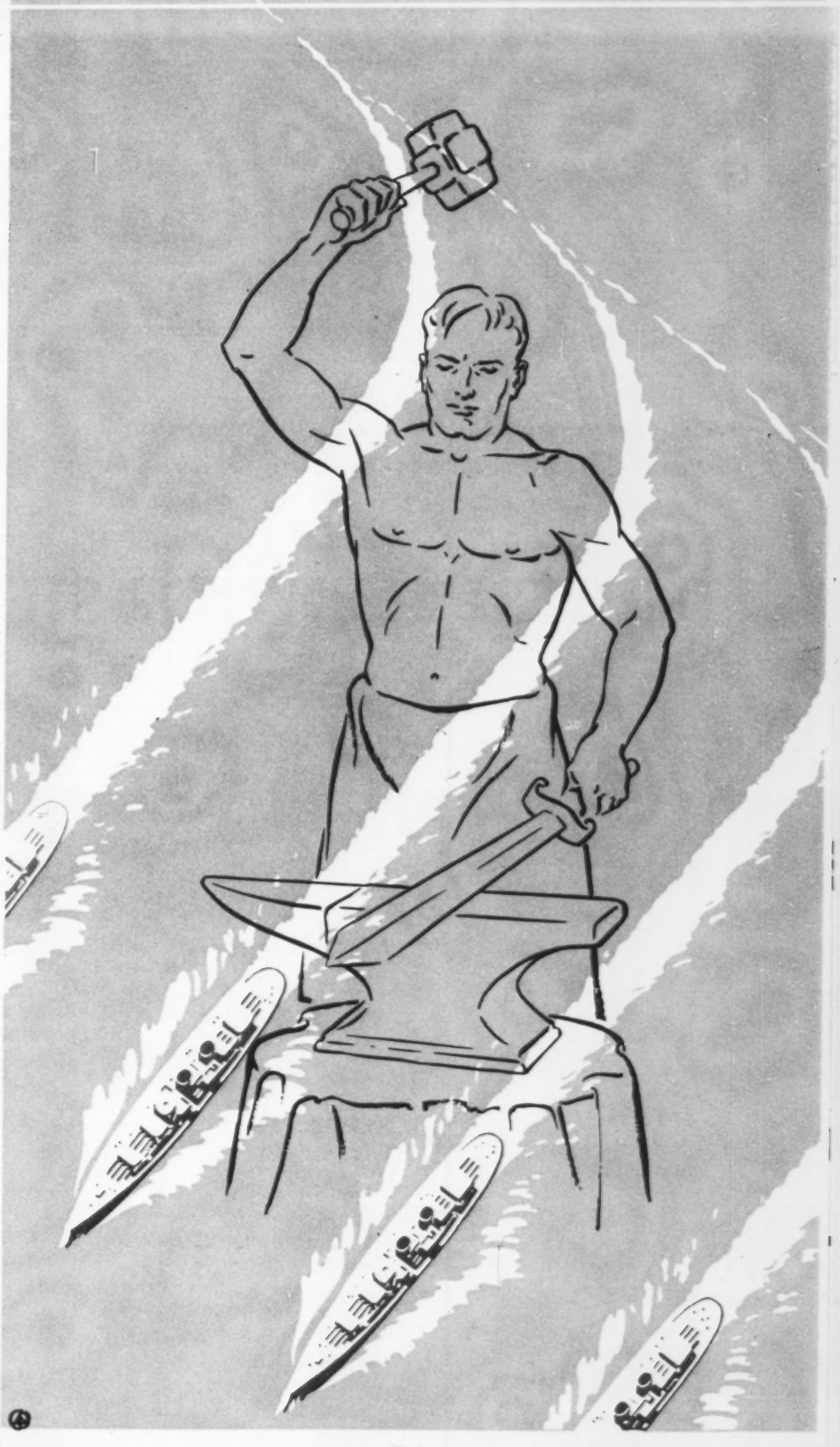

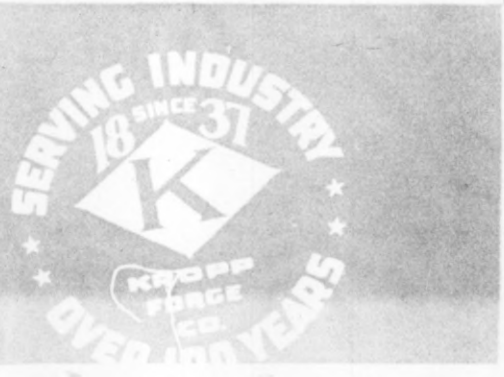

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News of A·S·M·E Publications

· BOOKS · CODES · STANDARDS · SPECIAL REPORTS ·

{ For a complete list of A.S.M.E. Publications, consult pages 247-262 in the 1942 A.S.M.E. MECHANICAL CATALOG AND DIRECTORY }

A complete instruction book for determining capacity, steam rate, heat consumption, engine efficiency, and emergency governor operation.

THE TEST CODE FOR STEAM TURBINES

This practical text on turbine performance was formulated by the A.S.M.E. Committee on Power Test Code in response to insistent demand of the power industry and published in 1941. Compressed between two covers, for the first time, are:

Official requirements for standard tests of steam turbines including the newer types of back-pressure, extraction, mixed-pressure, and the combined automatic-controlled extraction-induction turbines.

Complete detailed instructions for making the necessary pressure, temperature and flow measurements.

Methods of calculating and reporting results.

Check list of items on which agreement should be reached before acceptance tests.

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Comprehensive instructions on making corrections to test performance.

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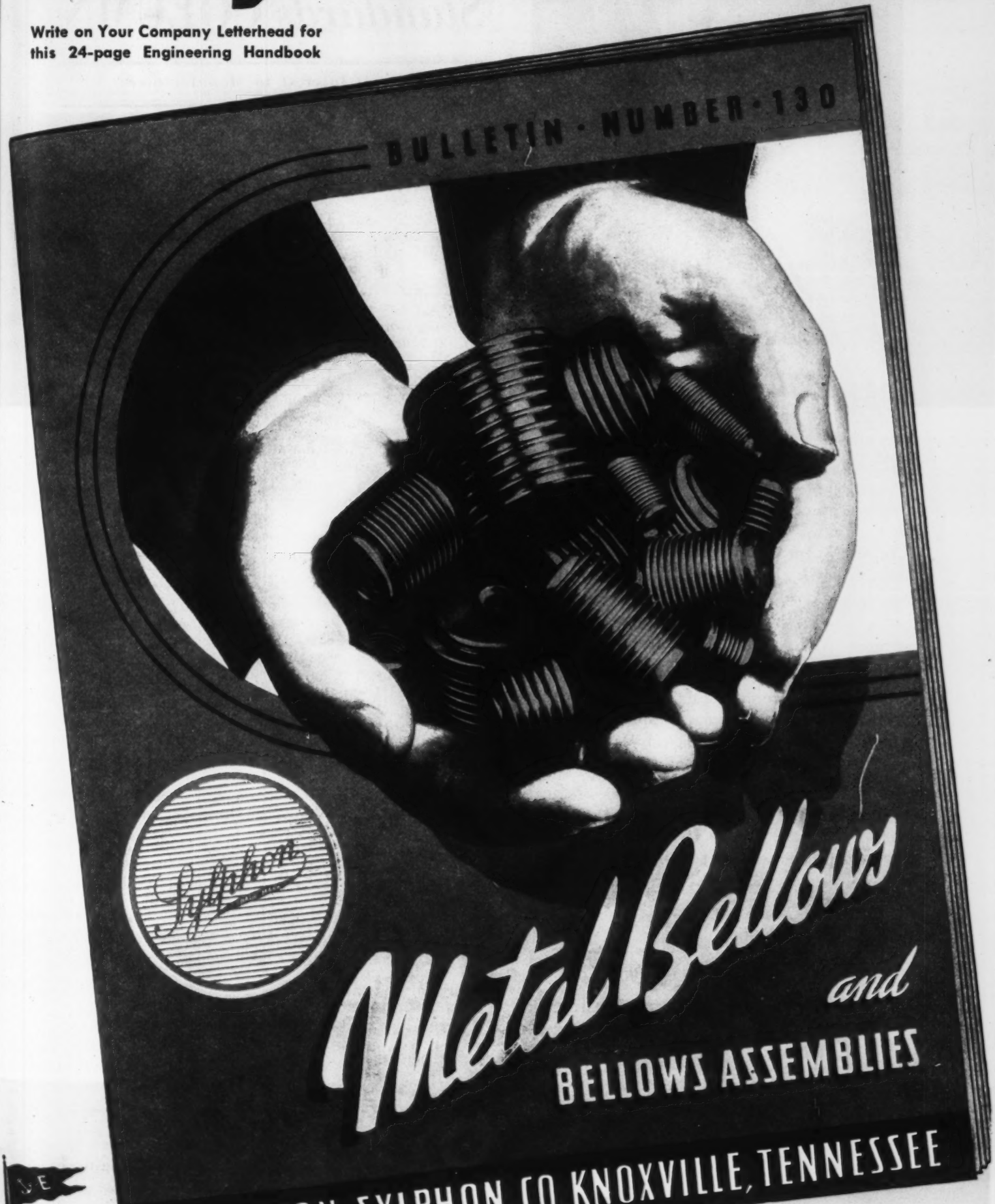
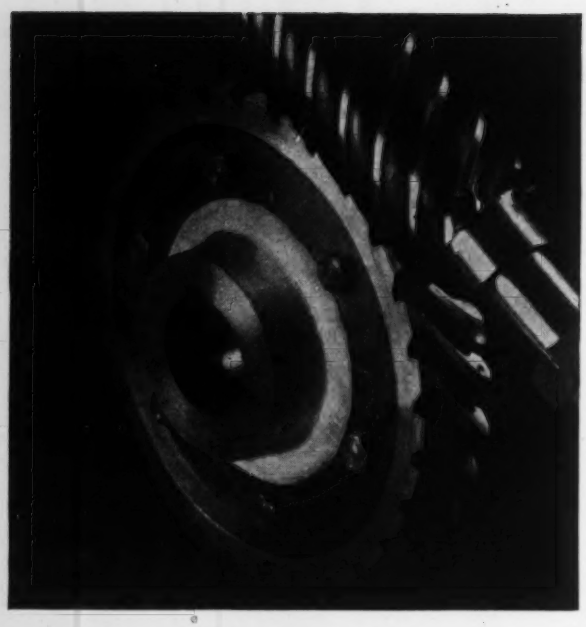


The All-Navy "E" award for production.

Originators and pioneers of the Sylphon Seamless



Around the Clock–the Months–the Years!

In quieter times, performance was measured in hours, months, years. Now, *minutes* are the unit. Cleveland Worm Gear Speed Reducers make every minute count by keeping machines in continuous operation.

You no doubt have been impressed by the frequent comment "we have no shutdowns," by others who have bought scores or hundreds of Clevelands.

Many of these customers installed their first Cleveland Units 15 to 20 years ago on applications subject to heavy shock loads, yet have had no need for replacement or maintenance at any time.

Count on Clevelands to keep *your* machines going. The same caliber of Engineering ability that has developed standard and special Cleveland Worm Gear Speed Reducers for 30 years, is available for applying them to your particular equipment.

The Cleveland Worm & Gear Co., 3264 East 80th Street, Cleveland, Ohio.

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The Standards COLUMN

News of Interest to Manufacturers

Surface Quality

The Proposed American Standard for Surface Roughness which has been available in pamphlet form for the past two years is now undergoing revision preparatory to final approval. During this period there have been a number of developments in the standardization of surface quality, its specification, and measurement.

The Sectional Committee on Classification and Designation of Surface Qualities, B46, has kept in touch with these developments and is taking definite steps to revise and extend the present text of the proposed standard and to supplement it with the new material. At a meeting held in Cleveland last June the appointment of a special subcommittee to undertake this task was authorized.

This subcommittee has been asked to complete its report by September 15, 1942. It, accordingly, held its first meeting on August 13, 1942 and a second meeting will probably be held early in September.

One of the problems before the subcommittee is the unification of the present practices for indicating surface quality on drawings. When the American Standard for Drawings and Drafting Room Practice, Z14.1-1935, was developed, the use of a V on the line indicating the surface together with a letter or number designating its quality or grade of the surface was recommended. This suggestion has since been developed and elaborated by two committees, namely, Subcommittee P217 on Surface Finish Designation of the National Aircraft Standards Committee, and Committee E-10 on Surface Finishes of the Society of Automotive Engineers. The merits of these two schemes were discussed at some length at the Cleveland meeting and the special subcommittee has been asked to give this subject special attention in cooperation with the subcommittee which is now revising the American Standard for Drawings and Drafting Room Practice.

It will be recalled that this project was authorized by the American Standards Association in March, 1932, and joint sponsorship assigned to the Society of Automotive Engineers and The American Society of Mechanical Engineers. Responding to the invitation of the sponsors, twenty-eight (28) national organizations indicated their interest in it and the organization meeting of the sectional committee was held on December 9, 1932. At the Cleveland meeting Mr. R. F. Gagg, Assistant to General Manager, Wright Aeronautical Corp., Paterson, N. J., accepted the chairmanship of the sectional committee which was made vacant by the resignation of Mr. J. R. Weaver.

For further information—Address

The American Society of Mechanical Engineers
29 West 39th St., New York, N. Y.

"E" award for production.

Originators and pioneers of the Sylphon Seamless Metal Bellows and manufacturers of both rolled and

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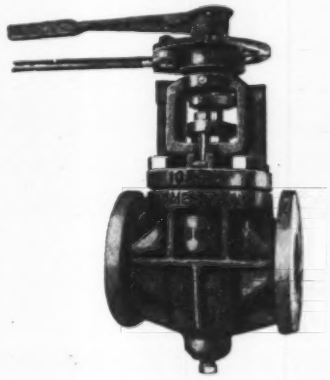
• NEW EQUIPMENT

"Lever-Seald" Plug Valves

Homestead Valve Manufacturing Company, P. O. Box 82, Coraopolis, Pa., announces a new line of "Lever-Seald" Plug Valves for 150 pounds working pressure.



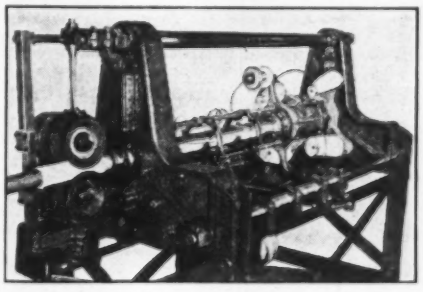
Face to face dimensions of each valve in the new line are the same as those of the corresponding size of wedge-gate valve. Thus they are instantly interchangeable with wedge-gate valves, without piping changes.

Other features of the new line include Homestead's traditional "quarter-turn" operation, and a powerful leverage to provide positive, extra-easy opening or shut-off under all conditions.

Sizes range from $1^1/_2$" to 10", in either semi-steel or steel.

New Horizontal Hose Reinforcement Machine

An entirely new type of Horizontal Hose Reinforcement Machine, developed to produce tubing and hose for airplane controls as well as many other industrial uses, has just been delivered to a prominent mid-western rubber manufacturer by the Fidelity Machine Co. of Philadelphia.



The new machine knits four to six feet of wire and fabric reinforcement per minute over synthetic rubber inner tubes on steel mandrels in one operation. This is said to constitute an important increase in speed of production. Standard 50 ft. mandrels can be used. These pass over rubber-covered tension feed sheaves through a knitting head equipped with latch needles supplied by four cones of yarn and one or two spools of wire. Fabric and wire reinforcement, knitted in one operation, makes a tough, flexible and more nearly non-kinking hose or tube. Mandrel with knitted cover is then drawn out of the machine over a set of rubber-covered tension wheels operating from the same drive and at identical speed to that of the feed sheaves. The hose or tubing is now ready for rubber impregnation and vulcanizing.

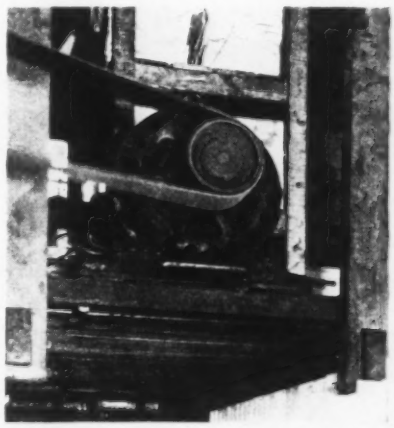
Manual speed adjustment, controlled by tension applied to belt drive, governs rate of speed. Interchangeable knitting heads, easily removed and replaced, adapt the machine to hose or tube diameters up to $2^3/_{16}$" O.D.—and simplify the change over.

Push button control; uniform speed of feed and take-off rolls; automatic stop motion; individual motor drive; and compact design—4 ft. x 7 ft. floor space—are other advantages for increased production.

The same machine may be used for making reinforced hose for a wide range of uses, with or without wire insertion.

1907 Motor Still Runs Machine Tools

All of the machine tools at the small Arlington Machine works near Boston have been powered by the same induction motor for the past 35 years, according to S. P. Birch, Proprietor.

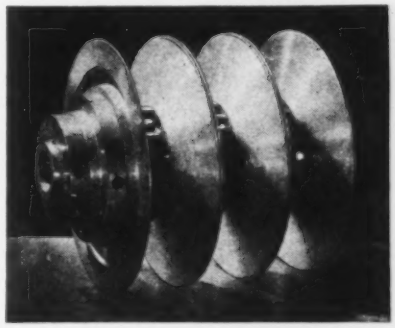


Rated at 7.5 horsepower for 200 volt service, the motor, built by Westinghouse, now, as it did during the last war, supplies motive power for the production of critical war materials. At the present time the motor operates 22 machine tools including five engine and screw cutting lathes with swings of from 13 to 42 inches, two planers with 13- and 6-foot beds, milling machines, shapers and grinders. All are belted to a main line shaft.

Although the motor has been operating on the average of 45 hours a week for the past 35 years, no maintenance other than semi-annual greasing has been necessary. About nine years ago replacement bearings were purchased but they were never installed. Despite the fact that the motor has never been cleaned all original parts and wiring are still retained.

New Wide-Range Vari-Pitch Sheave Increases Speed Variations for Wartime Production Needs

Because vital textile and machine tool production is running into new wartime demands for power transmission in wider ranges of speed variation, a new wide-range Vari-Pitch sheave has been developed by the Allis-Chalmers Mfg. Co., Milwaukee, Wisconsin, to give companies in these industries a product urgently needed.



Speed variations from 66% to 116% are possible with the new wide-range sheave, recently added to the regular line of Allis-Chalmers Texrope Vari-Pitch Drives. The new sheave is used with a companion sheave grooved for new, wide Texrope V-belts.

Manufactured in sizes to fit the shafts of all standard NEMA motors from fractional to 30 horsepower, wide-range Vari-Pitch sheaves are now available for distribution. Companion sheaves are made in sizes to meet the requirements of the wide-range applications.

The speed variation now possible with the new wide-range Texrope sheaves provides a flexibility that is proving especially adaptable in textile mill and machine tool applications, according to the manufacturer. Operating details on this wide-range sheave can be obtained in Bulletin B6082A.

New Electrode Made Expressly for "Fleet-Fillet" Welding Technique

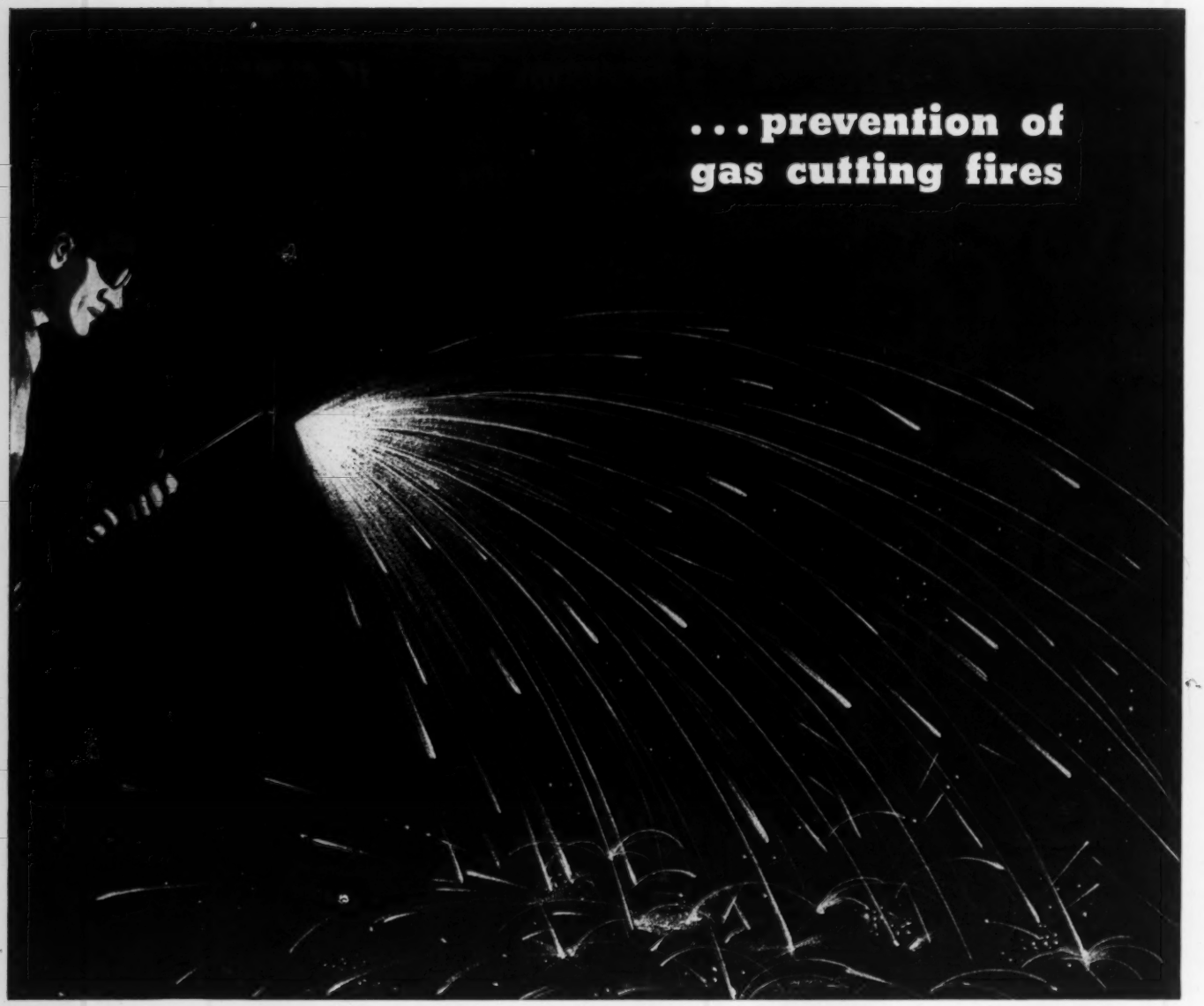
A new arc welding electrode, designed to add still more speed to arc welding in war production, is announced by The Lincoln Electric Co of Cleveland, world's largest manufacturers of arc welding equipment

The new electrode, designated as "Fleetweld 11," was created expressly for use with the "Fleet-Fillet" technique of arc welding, recently announced by the company The electrode is designed to obtain maximum benefit in speed of welding from the new technique.

"Fleetweld11 "was not only a fast flowing electrode, but it gives deeper penetration of metal into the root of the joint. It is of shielded arc type and heavily coated to exclude oxides and nitrides from the weld, thus assuring the high quality of weld metal characteristic of the shielded arc process.

In demonstration, the new electrode welded in 35 seconds a joint that required 1 minute and 17 seconds to weld with conventional electrodes and ordinary procedure.

Continued on Page 23



Information supplied by National Fire Protection Association

The surest way of preventing cutting and welding fires is to keep flames, sparks, molten slag and hot metal away from flammable materials. This elementary precaution is the most often ignored.

There are other precautions which, if observed, will do much to prevent cutting fires.

1. Always check fire hazards in new locations before starting work.
2. Have precautions in individual cases specified by responsible authority.
3. Move combustible material at least 30 to 40 feet away from cutting operation.
4. Sweep floors clean before lighting the torch.
5. If combustible material cannot be moved, or if sparks or slag may lodge in wooden structures, or drop through pipes or holes to floor below, use sheet metal guards, asbestos paper or curtains to localize flying sparks or slag.
6. Before cutting steel or iron be sure that it will not drop on combustible material.
7. When finished check surroundings thoroughly to make sure *all* smouldering sparks are put out.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.
MOLYBDIC OXIDE—BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"

Climax Molybdenum Company
500 Fifth Avenue • New York City

MOLY

• Keep Informed . . .

The new electrode and the "Fleet-Fillet" technique permits up to 100 per cent faster fillet welding, and will cut the production time on welded ships, tanks, guns and other strategic war materials.

Not only does the new technique permit faster welding, it permits the operator to do more work without fatigue. It decreases welding costs as well as the amount of electrode used per foot of weld.

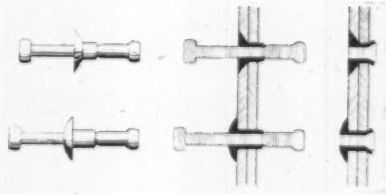
High currents are used, the electrode is advanced at a higher speed and the weld metal penetrates into the corners where the two pieces of metal are joined. The electrode is held at an angle of 45 to 60 degrees with the horizontal plate and 90 degrees with the electrode path along the joint. The arc produced is so short, the electrode coating practically touches the metal.

Having the same strength as a weld made by ordinary methods the "Fleet-Fillet" weld requires less metal. In a typical instance, the new technique required 0.26 pounds of electrode per foot, as against 0.37 pounds by the usual procedure. The cost, now further reduced by the new "Fleetweld 11" electrode, is reported 33⅓ to 50 per cent less than the usual procedure.

Designed to complete a weld in one pass, "Fleetweld 11" is made in 18-inch lengths and two diameters, 3/16-inch and 1/4-inch, packed in 50 pound containers.

Cherry Rivets

In the manufacture of combat planes for high altitude flying, numerous engineering and production problems have arisen in trying to build pressure-tight cabins in order that proper atmospheric conditions be maintained at all altitudes. Among other things the rivets used in pressurized cabin construction must not only have normal structural strength but must also hold considerable pressure.



One of the large manufacturers of high altitude planes reports that Cherry Blind Rivets have proved to be highly successful for this purpose. Although designed primarily as a production speed-up for the difficult riveting jobs, tests show that Cherry Rivets hold as high a pressure as a conventional rivet, due to the uniformity of head formation and shank expansion and the excellent clinching action secured through the Cherry riveting process.

Cherry rivets are playing an important part in speeding up aircraft production because they can be applied rapidly in places where it is almost impossible to use a conventional rivet. Standard drilling and dimpling tools are used to apply them. The only special tool required is the gun which is used to pull the stem or mandril with sufficient force to head the rivet on the blind side and break the stem. As the mandril is pulled through the rivet a tulip head is formed on the blind side and the pieces being riveted are securely clinched together.

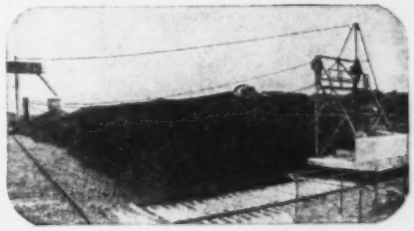
Diagram shows both brazier and countersunk types of Cherry Rivet, before and after application. The expanded section of mandril forms a tulip head on the blind side and expands the rivet shank, giving excellent clinching action.

Automatic Arc Welding with Heavily Coated Stick Electrodes

Complete equipment for automatic arc welding with heavily coated electrodes in cut lengths has been announced by the General Electric Co. The essential elements of this equipment also have been made available in order that automatic arc welding heads originally designed for operation with thyratron-controlled coiled electrodes can be converted for successful welding with stick electrodes.

Continued on Page 24

SAUERMAN
Power Scrapers



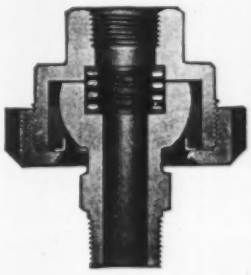
STORING COAL
—at lowest cost

At hundreds of power plants today Sauerman Power Drag Scrapers are storing and reclaiming coal at costs of a few cents per ton handled. This low cost is due to the rugged simplicity of the Sauerman equipment and its easy automatic operation.

Aside from its economy, the most important fact about this system is that it piles the coal in layers and avoids size segregation. There is little chance of spontaneous combustion when coal is piled in this manner.

Write for Catalog.

SAUERMAN BROS., Inc.
568 S. Clinton St. Chicago, Ill.



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Swivel 7S-8BS

Permit 360 degree Swivel movement with no tendency to bind where slight irregularities are encountered.

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Offered in twenty highly waterproof colors. 3/4-ounce quill-stopper bottle 25¢ at your dealers. Also available in larger sizes.

FOR YOUR SAMPLE BOTTLE write The Louis Melind Co., Ink Department, 362 Chicago Avenue, Chicago, Illinois

DE LAVAL-IMO PUMPS

FOR its production of IMO pumps and other marine equipment, permission has been awarded to the De Laval Steam Turbine Company to fly the Navy "E" burgee, emblem of outstanding excellence, and to De Laval employees to wear the Navy lapel insignia in evidence of work "Well Done."

IMO PUMP DIVISION
of the De Laval Steam Turbine Company
Trenton, New Jersey

AN IMPORTANT SERVICE IN THE NATIONAL WAR EFFORT

We conserve metals difficult to replace. We have solved the condensate corrosion problem in steam systems. In the Cook County Nurses' Home in Chicago, where extra heavy wrought iron piping withstood corrosive condensate only thirty days, Haering Glucosates corrected the condition, and test pieces six months later were free from corrosion deposits. We protect metals in boilers, piping, condensers and heat exchangers, too.

The Glucosates also conserve energy. Less fuel is needed—more production obtained—where Glucosates control scale, corrosion and living organisms. The Glucosates save raw materials, too. Less chemicals are used where Glucosates substitute for common inorganic materials.

Write today for free booklets of complete story. We will send sample containers and data forms to enable you to give us an accurate picture of your water problems.

Visit the "Chamber of Scale and Corrosion Horrors" in our booth No. 50 at the National Chemical Exposition, Hotel Sherman, Chicago, Nov. 24-29.

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GENERAL OFFICES 205 West Wacker Drive CHICAGO, ILL.
WE READ WATER

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The equipment is particularly suited to work where one or more complete joints can be made with a single electrode, such as in the welding of shells, wheels, and tubular assemblies where the starting and finishing ends of a single weld bead overlap. It has been used to make edge, lap, fillet, and groove welds. Applications have included the welding of machine gun water jackets, tank wheels, ordnance shells, and refrigerator parts.

The equipment is similar to that used for welding with coiled electrodes except for the electrode feed rolls and electrode guiding device. The mechanism includes a clamp for holding any standard stick electrode, and for transmitting current to the electrode. The clamp is attached to the end of a feed rod upon which two feed rolls operate to maintain the proper arc voltage through automatic thyratron control. The electrode is accurately guided to maintain the arc in a predetermined location. Limit switches govern the extremes of movement in either direction.

To operate the equipment, the welding operator inserts an electrode in the clamp, presses the start button, and the equipment strikes and maintains the arc, feeding the electrode at the proper rate to maintain the present arc voltage. Welding continues until stopped by a limit switch, at which time the electrode clamp returns to starting position to receive a new electrode. When more than one joint is to be welded with one electrode, an additional limit switch is used for each intermediate stop.

Automatic Stand-by Power Equipment Speeds Machining of Gears

General Electric automatic stand-by power equipment has been doing sentinel duty for a number of months at a plant of the DeLaval Steam Turbine Co., manufacturer of marine speed-reduction gears. By eliminating time losses due to power failure, and by substantially reducing spoilage in this plant, the equipment has not only speeded the production of these vital gears but has already justified its installation.

Certain of the final hobbing operations in the manufacture of speed-reduction gears cannot be interrupted or even subjected to appreciable speed variation without affecting the accuracy of the work. This is because

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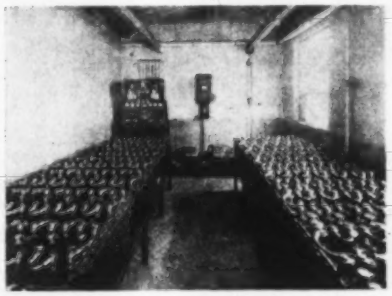
differences in the momentum of the work with relation to that of the cutting tool would tend to produce variations in the depth of the cut.

To guard against power failure or excessive voltage fluctuation, it was decided to install a stand-by power source. The primary requirement was that the equipment have a capacity to supply the essential loads, ranging from 17 to 23 kw (75 to 100 amperes at 230 volts), for not less than four hours. Experience showed that power failures would not extend beyond this length of time.



Other requirements were: instantaneous and automatic transfer from stand-by to normal source and from normal to stand-by source; battery charge rates automatically varying from a trickel rate during stand-by periods up to more than normal rate if necessary following emergency discharge periods; and highest possible dependability.

General Electric engineers working with the Edison Storage Battery Co. designed an automatic power-supply system consisting of a motor-generator set, a battery, and control equipment to meet these requirements. The motor-generator consists of one 15-hp, 230-volt motor and two 5-kw, 50-volt generators. The motor is supplied by the normal source during stand-by periods and by the battery during interruptions in normal source. The generators, each in series with half (96 cells) of the battery, regulate the voltage during both charge and discharge.

The control panel is provided with meters, an undervoltage relay, disconnect contactors, and voltage regulators with their control equipment. Two carbon-pile regulators vary the field current of the generators through voltage control across the battery during charge and across the load during discharge.

The regulators also perform the triple function of charging the battery at various rates from a trickle to more than normal; bucking the battery voltage during discharge when above the required load voltage; and boosting the battery voltage during discharge when it is below the required load voltage.

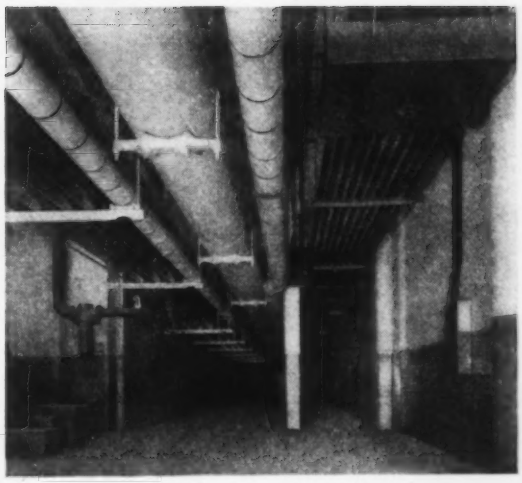
All regulation is automatic, and is so close that machine operators in the gear hobbing department do not know whether power is coming from the normal source or from the battery.

Radial Spot Welder

A radial-type Gun Spot Welder, P-1-R, is now being offered by Sciaky Bros., 4915 W. 67th St., Chicago, in both stationary and buggy-mounted units. It is equipped with a special Sciaky welding timer and operates on single phase A-C, 220 or 440 volts. Hydraulic pressure is supplied by a hydropneumatic booster, which can feed a gun able to supply a maximum electrode pressure of 1,800 lb with 90 psi of air supply.

Fixed or crowded jigs can be easily reached with the portable buggy-mounted welding gun (illustrated). The maximum area reached by the stationary unit is represented by a circle of 21 ft diam.

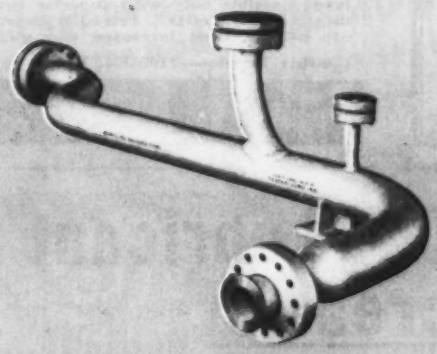
Continued on Page 26



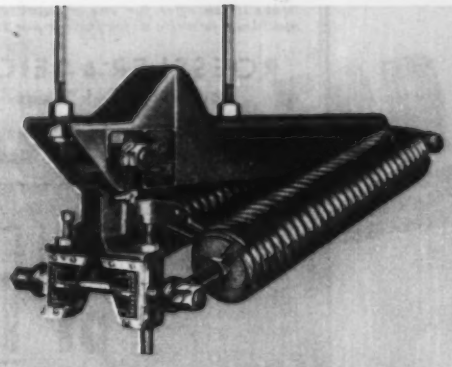
FLUID TRANSPORT — What does it mean? It means carrying steam from a boiler at 2000 pounds per square inch; vapor from a refinery still; gas from a tank; water from a reservoir. It means more than that. It means compensating for such factors as heat and cold, expansion and contraction, pressure – factors as important in themselves as the fluid to be transported. It means the manufacture and fabrication of the many connecting links that convert a pile of pipe into a piping system.

GRINNELL

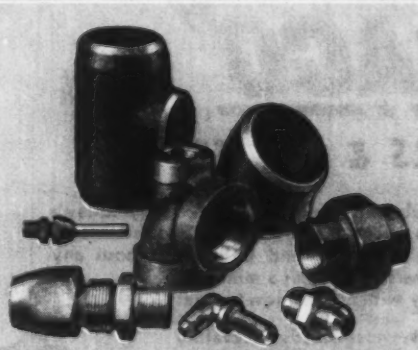
FLUID TRANSPORT



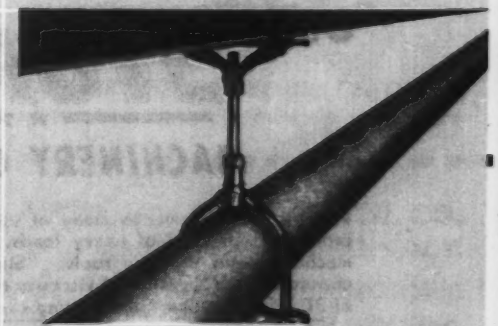
1 PREFABRICATED PIPING—Complete sub-assemblies that are pre-tested for strength, underwriter approved and easy to erect.



2 GENSPRING CONSTANT-SUPPORT HANGERS—Mass produced, yet prefitted to exact engineered layouts . . . safeguard high-temperature piping systems.



3 PIPE AND TUBE FITTINGS—Steel, cast iron, malleable iron, brass, aluminum . . . screwed, flanged, socket, flared tube and welding.



4 ADJUSTABLE PIPE HANGERS engineered to provide the right hanger for ANY piping ANYWHERE. Faster to install . . . stronger . . . adjustable after installation.

DATA FOLDERS on these and other Grinnell piping products will be gladly furnished. Grinnell Company, Inc., Executive Offices, Providence, R. I. Branch offices in principal cities of United States and Canada.

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WHENEVER PIPING IS INVOLVED

SACRIFICE SALE of

OIL FILTERS
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CLARIFIERS

This is new equipment of a high grade manufacturer. We will sell any or all these at a greatly reduced price in order to liquidate.

3 Oil Filters, Model OFK, up to 75 gallons per hour, motor drive, requiring 0.5 H.P.

2 Oil Filters, Model O-10 up to 165 gallons per hour, belt drive, requiring 0.9 H.P.

2 Oil Filters, Model OM-10, up to 165 gallons per hour, motor drive, requiring 0.9 H.P.

1 Benzine Clarifier, Model BFK, up to 700 gallons per hour, belt drive, requiring 1.5 H.P.

2 Benzine Clarifiers, Model BHK, up to 1500 gallons per hour, belt drive, requiring 1.5 H.P.

Make us an offer for one or more of these machines, or write us for further particulars.

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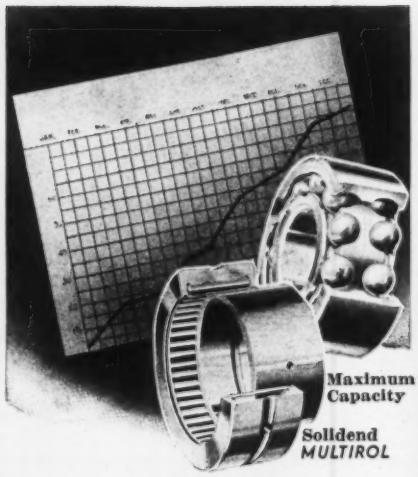

Increasing Production Quotas with McGILL Precision Bearings

American industrial production is at the highest peak of its history—and yet, quotas are being increased . . . the superior performance of McGILL Precision Bearings parallels the record of American war production.

The gruelling twenty-four-hours-a-day seven days a week schedule, so necessary in maintaining our war supply lines, is made possible only with superior equipment. . . . McGILL Precision Bearings are helping meet increased war quotas.

Bearing Division—1100 No. Lafayette St.

McGILL MANUFACTURING COMPANY, INC. VALPARAISO, INDIANA

IF YOU NEED A Lubricant of Increased Load Carrying Capacity

USE "STURACO" ★★★★ EXTREME PRESSURE ("EP")

MACHINERY OILS & GREASES

• Here is the answer to many of your lubrication problems caused by today's production demand of heavy loads, high speeds, and continuous operation of machinery and machine tools. "Sturaco" EP Oils and Greases, without any change in your accustomed viscosity or consistency, offer a minimum of 300% *increased load carrying capacity* with notable low torque.

Lubrication of ways—spindle bearings—gear heads—elevating screws—speed reducers—are typical examples where "Sturaco" application has solved tough lubrication problems. If you need help, write or phone today.

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SEND FOR the new "Sturaco" booklet outlining laboratory research behind this genuine development, describing typical applications and listing various grades.

For All Cutting Fluid Problems
D. A. STUART OIL CO.
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Warehouses in All Principal Metal Working Centers

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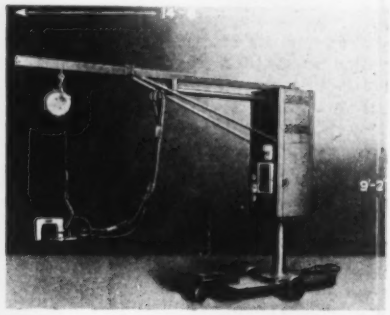
Secondary cables are thin, flexible, and short; the reduction in the usual size of secondary cables is made possible because of the use of fixed heavy copper bars (water-cooled) in the length of the secondary circuit.



In steady production conditions, this welder is capable of welding: corrosion-resisting steel, pickled steel, zinc-coated steel and Monel metal in thicknesses of from 0.016 in. plus 0.016 in. up to 0.064 in. plus 0.064 in. It will also weld two unequal thicknesses up to a total welded thickness of 0.500 in., provided that one of the two thicknesses does not exceed 0.040 in.

In welding pickled mild steel or standard steel, a speed of 180 satisfactory spot welds per min. can be attained on thicknesses up to 0.032 plus 0.032 in. Speed decreases as the sheet thickness increases.

Drawing Inks

Justrite Drawing Ink has just been added to the line of marking devices and stationery products manufactured by The Louis Melind Company of Chicago, New York and San Francisco. The ink has been developed and tested for a two-and-a-half year period and has been accepted by the drafting departments of many leading schools and firms.

Offered in twenty waterproof colors, the product comes in ¾-ounce quill-top bottles and 4-ounce, 16-ounce, and 32-ounce containers.

New Industrial Humidifier

A new industrial humidifier, which provides humidification and also cooling by evaporation and air circulation, is announced by Carrier Corp., Syracuse, New York, leading manufacturer of air conditioning and refrigeration equipment.

The humidifier provides humidified air, automatically controlled; cooling, by evaporation; tempering, cleaning, and uniform circulation of air in addition to humidification. Providing ventilation by connection to outdoors, the equipment is particularly effective for blackout buildings.

Features of the new industrial humidifier include the suitability to any size plant, since it may be installed singly or in multiple. In addition, it requires no floor space, uses no distributing ducts and is easily installed and moved to meet plant changes in production or machine layouts. Carrier engineers designed the unit so that it may be installed with no interruption of production.

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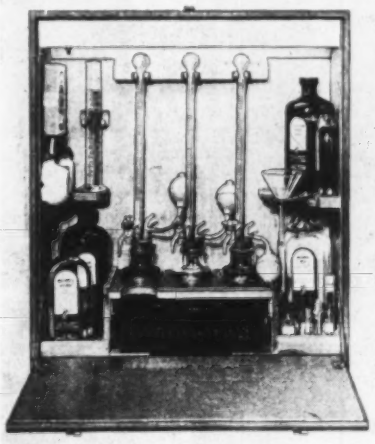
Accessibility of all parts is also stressed in the announcement. The drip pan on ball bearing rollers moves on a track, permitting complete access to the enterior of the unit and humidifying packs from the bottom. The air outlet is hinged to swing aside, providing an opening to the fan and fan motor.

Water Testing Equipment



A new series of Water Test Sets is announced by W. H. and L. D. Betz, Gillingham and Worth Streets, Frankford, Philadelphia, Pa. These "A" Series Test Sets include the necessary chemicals and apparatus for determining hardness, alkalinities, chlorides, phosphates and sulfites in water, when any two, three or four of these tests are required. A special cabinet designed for use on table or wall is provided. All chemicals and apparatus are contained in the cabinet, held in a secure position and ready for instant use. A portion of the opened cabinet door forms a convenient acid-resistant laboratory work table, and a fluorescent light provides correct illumination for the tests. The protection afforded by the cabinet minimizes breakage and eliminates errors caused by dust or dirt. All "A" Series Test Sets are ready for immediate shipment. Descriptive literature available.

Laboratory Equipment Takes Over for the Elements

Engines for airplanes of the future are constantly being tested by the Army Air Force to determine performance at different altitudes, temperatures, and humidities. They are tested not only at altitudes as high as 40,000 feet, where temperatures drop to 67 F and where air pressure falls to 5.54 inches of mercury (absolute), but also at low altitudes over deserts, where the temperature soars to 120 F, the relative humidity amounts to only 5 to 10 per cent, and the pressure may rise to over 29 inches of mercury.

The engines undergoing test never leave the ground, but meet these extremes of atmospheric conditions in Army Air Force laboratories, where refrigeration equipment, electric heaters, and evacuating equipment are taking over for the elements.

Such a laboratory will soon be put into operation in the United States. It will house several test chambers, all of which will be testing engines under different conditions. To accomplish this, air will be partly conditioned and then delivered to the various test chambers by a 250-horsepower blower. At each test chamber the air will be further conditioned to obtain the exact

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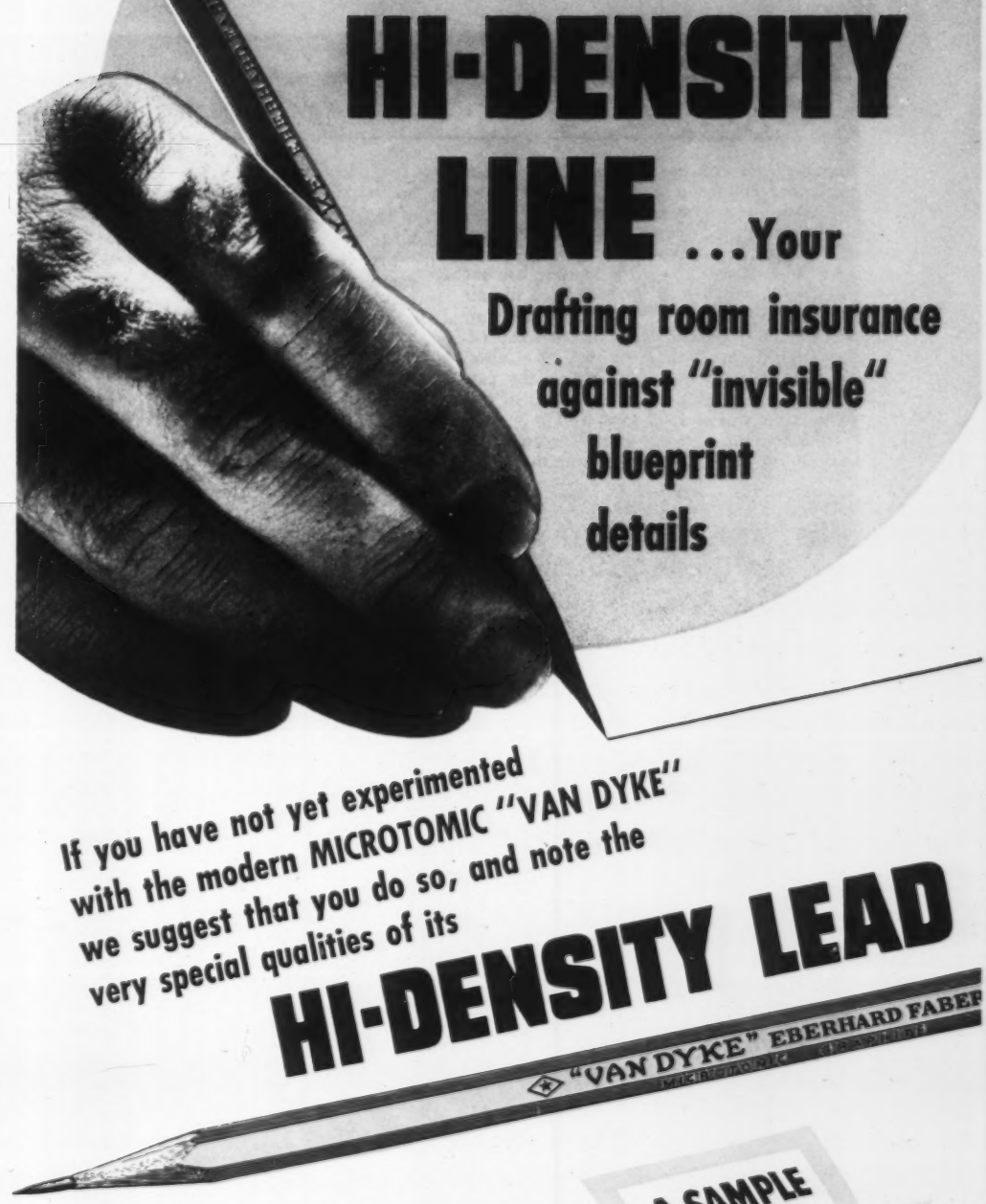

Uniformly opaque lines on tracing paper and therefore more sharply white when blueprinted.

Less pressure required, and therefore lines that are more easily erased.

Density of Color without thickness of lead deposit, and therefore less smudging.

MICROTOMIC grading is consistently accurate—all leads of the same degree are always identical.

High density of lead structure—therefore stronger points and notably longer wear.

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A SAMPLE PENCIL FREE!

FOR TEST PURPOSES! Clip The Coupon, and attach to your business letterhead.

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37 Greenpoint Ave., Brooklyn, N.Y.

I'd like to test your MICROTOMIC VAN DYKE with the Hi-Density lead. Please send one as indicated below:

.....degree, round lead
(choice of 18 degrees)

or.....degree, chisel shaped lead
(6H, 4H, 2H, HB, 2B, or 4B)

NAME TITLE

NAME OF COMPANY

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CITY AND STATE

humidity, temperature, and pressure for the particular condition desired, and then delivered to the engine carburetors.

If air of extremely low humidity is desired, the air will first be dropped in temperature to a point as low as −70 F to condense out the vapor, which will separate from the air in the form of snow or frost. The dried air will then be reheated to the proper temperature by General Electric finned Calrod heaters before being delivered to the carburetors. The total reheating power of this installation will be 1500 kw.

The amount of moisture permitted to remain in the air will be regulated by the extent of chilling to which the air is subjected. Slight chilling drives out only a small amount of moisture. Steam will be mixed with the air to raise the humidity.

Six General Electric motors will drive compressors, which with the electric heaters will regulate the temperature of the air delivered to the carburetors. Evacuating equipment will produce any pressure between 29.92 inches of mercury at sea level and 5.54 inches at 40,000 feet. To simulate flying conditions completely, provision is made for cooling the gasoline to −10 F and for heating it to 80 F.

War jobs need . . .
Arkwright's sharp, clear lines—and permanence!

Inferior tracing cloth may be disguised to look like Arkwright – but it won't give Arkwright results! Strong, evenly woven, uniform, this tracing cloth pays for itself over and over in clean, snappy blueprints. Years from now, your drawings will be as clear as they are today. This is WAR – play safe – war-time speed demands the best! Arkwright Finishing Company, Providence, Rhode Island.

Arkwright TRACING CLOTHS
AMERICA'S STANDARD FOR OVER 20 YEARS

Metals Salvaged from Ashes

Ashes taken from two process-steam boiler pits in the salvage department's shop are yielding critical materials at one of the General Electric Company's major Works.

Shop refuse and rubbish from all parts of the Works are used for fuel. Ashes removed from the boiler pits are passed through a ball mill, or grinder; a magnetic separator, which separates the ferrous from the nonferrous metals; and a concentration table which sorts out the finer particles. Metals reclaimed by this method include iron, steel, brass, copper, and aluminum. In 1941 a total of 624,000 pounds was recovered, representing a gross cash return of $10,000.

Other items, which in the past have been unsalvageable economically, are yielding critical materials in quantities that are worthwhile in these times. For example, the salvage department receives from the wire-drawing department a waste known as "copper and grease." It is taken from the pits under the wire-drawing machines and consists of a mixture of wire-drawing compound and fine copper particles. The wire-drawing compound is in liquid form, and contains water, soap and tallow which is applied to the drawing dies for lubrication and cooling. This flows into a pit underneath the wire-drawing machine and carries with it fine pieces of copper. It is shoveled from the pit into steel drums and when the water and grease are removed, the copper remains in dry, hard chunks. Last year 88,200 pounds of copper reclaimed in this way were shipped out to the smelters and vendors for conversion into raw materials. Gross return: $8,000.

• BUSINESS CHANGES

Power Show Will be Held at Madison Square Garden This Year

The management of the Fifteenth National Exposition of Power and Mechanical Engineering announces that the Exposition will be held at Madison Square Garden, New York, November 30th to December 4th. Originally scheduled for Grand Central Palace, the change in location was made necessary when the Army took over the Palace recently.

More than 150 leading manufacturers have already engaged exhibits space, and it is expected there will be nearly 200 exhibits, geared to the War program, by the time the Exposition opens.

Permanent headquarters of the Exposition Management are retained at Grand Central Palace, New York. Charles F. Roth is Manager of the Exhibition, and E. K. Stevens, Associate Manager.

Rowland Appointed by Carrier

Appointment of Harold L. Rowland to the administrative staff of Carrier Corp. of Syracuse, largest producer of air conditioning and refrigeration equipment, was announced today by Cloud Wampler, President.

Mr. Rowland has had a broad experience in business and financial fields. He is resigning as President and Director of George F. Getty, Inc., Vice President, Treasurer and Director of the Pacific Western Oil Corp., Vice President of the Mission Corp., and President and Managing Director of the Hotel Pierre, New York City.

Ohmite Again Expands Factory

Another large expansion in factory space and production facilities has been made by the Ohmite Manufacturing Co., Chicago,

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manufacturers of Rheostats, Resistors, Tap Switches, Chokes and Attenuators.

This is in addition to the big increase in plant size announced a short time ago, and is in line with the earnest desire of the Ohmite Organization to do everything possible to help win the war.

It provides more space and facilities to produce more units to meet the greatly increased demand for Ohmite Products in the war effort. Ohmite units are used in planes, tanks, and ships, in communications, electronic and control equipment, in industry and research. For literature, write to Ohmite Manufacturing Co., Chicago, Ill.

Power Transmission Specialist Joins Foote Bros.

Foote Bros. Gear & Machine Corp. announces the recent addition to its contact engineering staff of Irwin A. Marshall, a resident of Cleveland for thirty years and a graduate of Lakewood High School and Cleveland College, to represent the Company in the Cleveland and Northern Ohio territory.

Widely known in this area as an expert in the power transmission field, Mr. Marshall has been serving industry for the past twelve years in Ohio and the Central States as a sales engineer and specialist on speed reducers, couplings, and gears.

Allegheny Ludlum Names McFadden

The appointment of W. G. McFadden as Acting Manager of the company's Chicago office to replace P. E. Floyd, now serving with the Government, has been announced by R. M. Allen, Allegheny Ludlum General Sales Manager.

New Manager for Northwest District

James S. Hagan of La Grange, Ill., has been appointed manager of the Northwestern District of the Westinghouse Electric & Manufacturing Co.'s district manufacturing and repair department. He succeeds R. E. Powers, now serving as Pacific Coast District manager of the department.

In his new position Mr. Hagan will supervise repair and manufacturing activities in a territory that embraces all or parts of nine states. All of Minnesota, Wisconsin, Iowa, North Dakota and South Dakota are included in addition to parts of Illinois, Indiana, Nebraska and Montana.

Electrical and steam equipment such as generators and turbines are repaired at plants in Chicago, Milwaukee, Wis., Minneapolis, Minn., and Indianapolis, Ind. The Chicago and Minneapolis shops also manufacture switchboards, control equipment and motors.

Mr. Hagan joined the Westinghouse graduated student course in 1916 and the following year was assigned to the railway section of the General Engineering Department. From 1917 to 1919 he was a first lieutenant of engineers with the United States Army, serving overseas.

After World War I, Mr. Hagan returned to Westinghouse and in 1922 was sent to Java in the Dutch East Indies in connection with the electrification of a railroad. From 1924 to 1927 he was associated with the Baltimore and Ohio Railroad, and from 1927 to 1935 he was head of the electrical department of The Central Railroad of New Jersey. In 1935 he became western railway sales manager of Thomas A. Edison, Inc., Edison Storage Battery Division, a position he occupied until rejoining Westinghouse recently.

Born in Monett, Mo., December 27, 1895, Mr. Hagan attended grade and high school at Pittsburgh, Kansas, and received a bachelor

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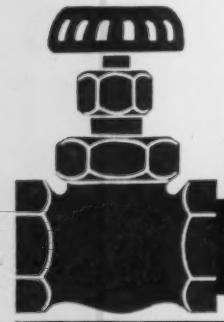


A Time-Saving Valve FOR IMPORTANT PRODUCTION LINES

In these critical times when uninterrupted production is all-important, every minute saved in maintenance means more productive hours.

Lunkenheimer "N-M-D" (non-metallic disc) Valves cut maintenance time to the bone, because it's only a matter of minutes to renew a worn disc and keep the valve on the job.

Users of Lunkenheimer Valves are profiting from their wise policy of buying highest quality. They are getting continual tangible evidence of what really good valve performance means in dependable and low-cost service.

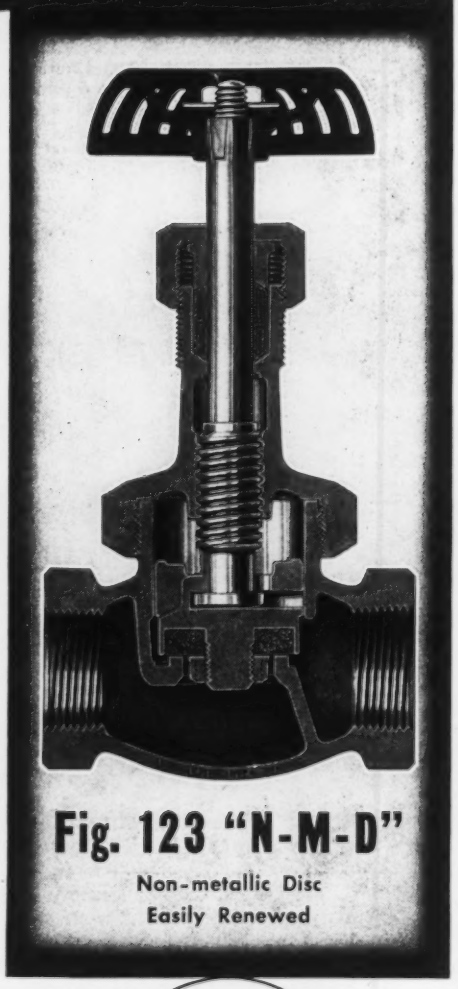
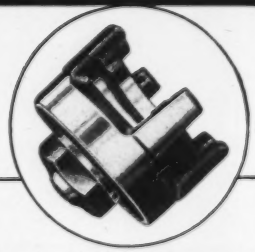


Fig. 123 "N-M-D"
Non-metallic Disc
Easily Renewed

Since virtually all materials used in the manufacture of valves are on the list of critical materials, valve users are urged to furnish the highest possible preference ratings and proper "end use" Allocation Classification Symbols on their orders. This will be of mutual helpfulness.



With a few spare disc holders complete with discs on hand, the time required for renewing can be cut to almost nothing.

ESTABLISHED 1862
THE LUNKENHEIMER CO.
"QUALITY"
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LUNKENHEIMER VALVES

• Keep Informed

of science degree in electrical engineering at Kansas State College in 1916.

Kevlin Appointed Falk Traffic Manager

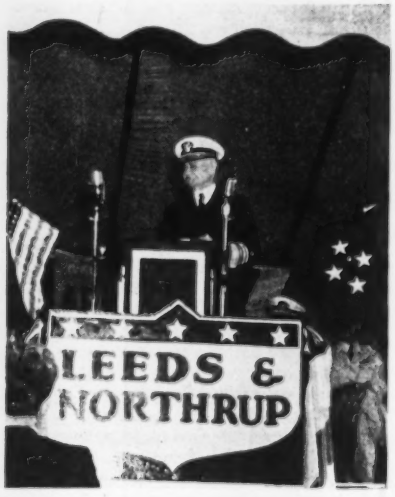
The Falk Corp., Milwaukee, Wis., announces the appointment of Frank J. Kevlin to the position of Traffic Manager.

Mr. Kevlin, who has been handling the traffic work for Falk for a number of years will continue in his jurisdiction over the traffic division and in addition will act as manager of the shipping department.

Leeds & Northrup Gets "E" Award

The Army-Navy "E" Production Award, for work "well done" in production of war materiel, was made to the Leeds & Northrup Co., Philadelphia, Pa., at noon on Saturday, September 5th. C. S. Redding, President, explained that the activities which led to the Award consist of maintaining a many-fold increase in production of the regular L&N lines of measuring instruments, telemeters, automatic controls, and heat-treating furnaces, and super-imposing on that production the manufacture of a large amount of classified materiel for the armed forces.

Admiral Henry A. Wiley, retired, in making the Award, said that the recommendations on which the award was based "could not have been higher." Admiral Wiley praised the cooperation, ingenuity, and full use of manpower and materials which the company had displayed.



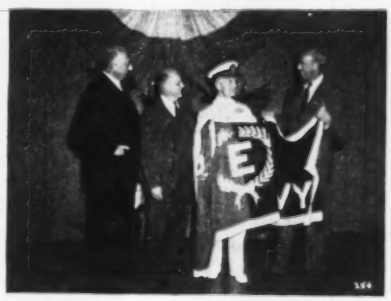
In addition to Mr. Redding, other spokesmen for the company were J. L. Johnson, President of the L&N Employees' Association, and W. F. Smith, President of the L&N Cooperative Association. The speakers urged the importance of continually increased production, and in Smith's words, pledged "Production is going to keep on rising until this war is won."

William L. Batt, President, SKF Industries, and Vice-Chairman War Production Board, spoke of the Board's pleasure in seeing outstanding production achievements recognized by the Army-Navy Award. Mr. Batt went on to the "mine above ground" theme, urging the development of scrap-salvage, and the redesign of products as the most available means by which our supplies of raw materials can be made to meet the present emergency. He cited the case of a shell part which was formerly turned from the solid, but is now stamped, with a resultant saving of 23 million pounds of brass per year. That, he said, is typical of hundreds of similar jobs which are waiting the time of designers and engineers to be done.

A ceremony which all workers could participate in, rather than merely attend, was arranged by a committee headed by L. R. Garretson, Advertising Manager. Just before noon, the entire L&N force marched behind a brass band, to a park near their plant. There, facing the speakers' platform at a short distance, was the biggest tent in the East not yet commandeered by the armed forces. Rented chairs filled the space between. The tent thus provided emergency shelter in case of rain, without requiring that the ceremony be held under cover on what turned out to be a fine day. Public-address amplifiers made it easy for speakers to be heard by the crowd of three thousand. A highlight was the presentation of "E" Pins to twelve employees, widely-known in the company and selected as "token" recipients for the entire organization. Another feature was the group singing of "America" and the National Anthem. The entire ceremony lasted an hour.

Buffalo Pumps, Inc. Awarded Army-Navy "E" Banner

In an imposing ceremony at North Tonawanda, N. Y., the new joint Army-Navy Production Award was presented to the management and employees of Buffalo Pumps, Inc. The presentation was made by Rear Admiral Wat T. Cluverius, U. S. Navy, Retired, and was accepted on the part of the Company by Edgar F. Wendt, president of Buffalo Pumps, Inc.



Admiral Cluverius, in a stirring address, gave eloquent testimony to the part which production must play in the all-out fight against the Axis. "Side by side with men of the armed forces must be industry," he said "American industry is the nation's strongest ally." More specifically, he declared that Buffalo Pumps, Inc. is considered among the U. S. Navy's strongest allies both in peace and war. Buffalo Pumps, the Admiral pointed out, are doing service in every naval vessel taking part in the World War.

One of the highlights of the occasion was when Edward C. Lyons, oldest employee of the firm, received the Army-Navy "E" Pins in behalf of the hundreds of employees present, from the hands of Commander Robert S. Smith, Jr., of the U. S. Navy and Lieut. Col. Charles F. Mosher of the Army.

"I pledge that we will continue to build the best pumps faster than ever before to speed American victory," said Mr. Lyons, as cheers and applause arose from the audience.

Upon accepting the award, Mr. Wendt spoke briefly. He emphasized industry's solemn obligation to our armed forces. "We, the soldiers, marines and sailors of production," he said, "pledge ourselves to continue excellent production in order to back up the great work of the men on active duty.

The Army-Navy Production Award is a significant milestone in the long history of Buffalo Pumps, Inc. Since 1892 this company has devoted its every effort to the development of better, more efficient and dependable pumps. In 1920 the United States Navy placed this company on its approved list—one of a few manufacturers to enjoy this distinction. In World War I, hundreds of Buffalo Pumps served our ships in active service.

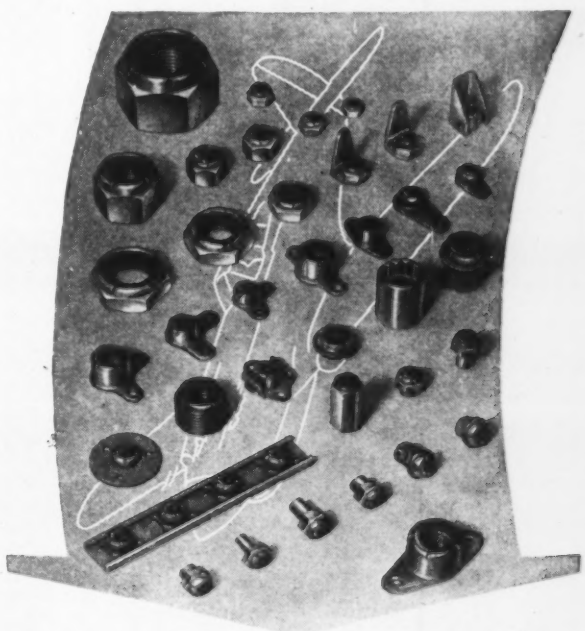
Since the Navy expansion program began in 1933, Buffalo Pumps, Inc., has devoted its ever-increasing production to help meet the needs for all types of pumps for armed and cargo vessels. Today, "Buffalo" is 100% at the command of our armed services.

Babcock & Wilcox Receives Maritime "M" Award

Rear Admiral Emory S. Land, chairman of the U. S. Maritime Commission, also administrator of the U. S. War Shipping Administration, awarded on Sept. 2 the Maritime Commission "M" burgee to the Barberton Works of The Babcock & Wilcox Co., New York, N. Y. The award represents the Commission's recognition of outstanding achievement.

The "M" burgee now flies alongside the Navy "E" burgee, which was awarded to

Continued on Page 32



PROVED ON AIRCRAFT

. . . and now used in every industry

1927 saw the first application of Elastic Stop Nuts on airplanes. When it was proved that these self-locking fastenings hold tight under any combination of vibration, shock, stress, and weather exposure, they were adopted for vital connections on all American military and transport aircraft.

Meanwhile other industries, profiting by such a convincing demonstration in the air, solved many of their most troublesome fastening difficulties with the same reliable nuts.

Today there are more Elastic Stop Nuts on this country's airplanes, tanks, guns, Naval vessels, and vital war production equipment, than all other lock nuts combined.

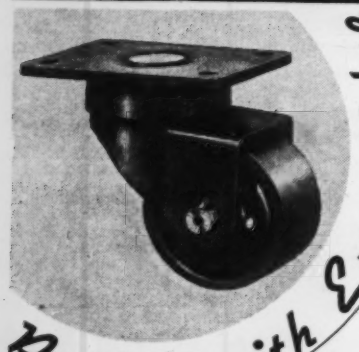
ELASTIC STOP NUTS may be the solution to *your* fastening problems. Sample nuts, for field or laboratory testing, will be furnished without cost or obligation. *Write for Catalog.*

» See the Elastic Stop Nut Exhibit at the National Metal Exposition.

ELASTIC STOP NUT CORPORATION • 2375 VAUXHALL ROAD • UNION, NEW JERSEY

WITH THE RED LOCKING COLLAR . . . SYMBOL OF SECURITY

DARNELL
Casters & Wheels



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Reduce floor and equipment wear to a minimum — increase employe efficiency with the casters that "always swivel and roll."

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LONG BEACH, CALIFORNIA
36 N. CLINTON ST., CHICAGO
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• Keep Informed . . .

The Babcock & Wilcox Co. on May 11, 1942. The Company is wholly engaged at present in the manufacture of power boilers and accessory equipment for the Navy, Maritime Commission, and war industries such as steel, chemical, aviation gasoline, artificial rubber, etc. The Company is also producing gun mounts for U. S Naval vessels.

In accepting the award, A. G. Pratt, president of the Babcock & Wilcox Co. said, "The fact that our efforts have thus been recognized by the Maritime Commission will surely spur us on to even greater accomplishment. We are proud of our record in the past as well as today. During World War I, B&W supplied 1096 boilers for ships of the Emergency Fleet, which were operated by the predecessor of the present Maritime Commission. We

are today supplying many boilers for the Commission's Liberty ships, other cargo vessels, and tankers. The boilers for all Liberty ships ordered to date will be built to a B&W design, even though many of them are being manufactured by seven other companies.

"B&W is helping to build the Victory Fleet, and you men and women of Barberton Works are just as much shipbuilders as are those who build the hulls on our sea coasts. You have a slogan posted in your shops which reads:

'The boilers which we produce, power your country's Navy and cargo ships, and on their performance depend the lives of brave Americans, the defense of your country and your home and family. Be sure that your every effort is as near perfect as your knowledge and skill can make it. You have a responsibility.'

Live up to that slogan and all that it implies and you will have accepted your responsibility. I have every belief that you will do so."

A brief address was also made by Governor John W. Bricker of Ohio. The ceremonies were broadcast over a nation-wide network.

Jenkins Bros. Lauded for War Work

The workers of the Bridgeport, Conn., plant of Jenkins Bros., manufacturers of valves, received the new joint Army-Navy "E" pennant August 19th, for excellence of production of war materials.

The gala ceremony took place outside the plant attended by officers of the Army and Navy and plant workers and their families, and was broadcast on a national hookup. Among the speakers were Governor Robert A. Hurley of Connecticut; Mayor Jasper McLevy of Bridgeport; Farnham Yardley, president of the company, and Bernard J. Lee, vice president in charge of manufacturing. Lowell Thomas acted as master of ceremonies.

Rear Admiral Wat T. Cluverius made the award. As personal representative of Secretary of the Navy Knox, he declared that the dedication represented "a unique occasion where the armed forces of the United States are recognizing an outstanding example of aid from their strongest ally—industry."

The admiral paid further tribute to his listeners when he revealed that he and his fellow officers in the Navy were dependent on Jenkins valves for "efficient functioning in submarines, battleships, cruisers, and corvettes for more than half a century."

Mr. Lee received the "E" pennant from Admiral Cluverius on behalf of the Jenkins workers and immediately turned it over to four of the oldest employees, who carried it to a flagpole where it was raised aloft.

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BERNARD R. SCHNEIDER
621 Sixth Avenue, Lyndhurst, N. J.

RATE Announcements under this heading in MECHANICAL ENGINEERING are inserted at the flat rate of $1.25 a line per issue. $1.00 a line to A.S.M.E. members, minimum charge, three line basis. Uniform style set-up. Copy must be in hand not later than the 10th of the month preceding date of publication.

• Keep Informed . . .

Kropp Forge Co. Gets Army-Navy Pennant for Production

Kropp Forge Co., Chicago, has been awarded the new Army-Navy "E" pennant for production of war materiel according to a telegram Roy A. Kropp, president, has just received from Admiral H. A. Wiley, Washington.

A white star in the navy section of this burgee testifies to a previous award of the navy's Bureau of Ordnance. Kropp Forge was among the first concerns in the Chicago area to receive these production honors.

"We are too busy turning out forgings for the army and navy to stop for ceremonies," said Mr. Kropp. "But each of the more than 600 shop employees will receive a special "E" button symbolizing his part in securing this company honor," he added.

• LATEST CATALOGS

Flow Meters

"Flow Meters by Cochrane"—New Edition, issued by Cochrane Corp., Philadelphia, Penna. This new edition of Cochrane's complete flow meter line now totals 56 pages. Besides describing electric, mechanical, linameter (area), ring balance, liquid level and weir meters, the catalog also covers the new 2 pen electric flow recorder with ratio indicating pointer, an improved low pressure (1" to 10" water differential) electric type meter, and the ultra high pressure (6000 psi) ring balance meter. Exceptionally well illustrated, this catalog also includes a discussion of flow metering benefits and complete listings of specifications and ranges.

Canton Stokers

Canton Stoker Corp., Canton, Ohio, announces two new bulletins which have just been released. One covers their Commercial and Industrial Wormfeed Stokers, listing some of the improved features of this equipment. The other is a Condensed Catalog of the entire Canton Stoker line.

Edward Intex Valves

Catalog No. 12—G5, a new folder describing hard surfaced integral seat globe stop valves for pressures to 1500 lb at 950 F has just been issued by The Edward Valve & Mfg. Co., Inc., East Chicago, Ind.

Carrying the trade name Intex (Integral Seat Valves of Extra Value) these globe valves are specifically designed for high pressure and high temperature service and incorporate many unique design features. The disk and integral seat are faced with Stellite, a high hardness alloy, which is extraordinarily resistant to both erosion and corrosion. Minimum weight with abundant strength has been accomplished by equalizing the distribution of metal around the body flow areas so that in heating and cooling there is no distortion. Disassembly is unusually easy, requires no special tools, and working parts are readily accessible.

South Bend Lathe Catalog No. 100-B

A new catalog describing the entire line of South Bend Engine Lathes, Toolroom Lathes, and Turret Lathes has just been published by the manufacturer. The Engine Lathes and Toolroom Lathes range in size from 9" swing to 16" swing. The Turret Lathes are made in three sizes, having 9", 10", and 16" swings. This catalog contains 48 pages, size 8½" x 11", and can be conveniently filed in a standard letter size catalog file.

Each size and type of lathe is illustrated and fully described. Specifications are tabulated to facilitate the selection of the lathe required for any desired application. Attachments, tools, and accessories for adapting these lathes to special classes of work are also illustrated and described.

Catalog No. 100-B can be obtained on request from the South Bend Lathe Works, Dept. 6M, South Bend, Indiana.

Fire Brick

"Mono-Fibrik—High Grade Plastic Monolithic Fire Brick" is the title of a 28-page booklet recently published by the Mexico Refractories Co., Mexico, Missouri. Well illustrated and concisely written, it covers the advantages of the use of Mono-Fibrik plastic fire brick, methods of installation and its application in lining H. R. T. and Watertube boilers, and all types of industrial and metallurgical furnaces.

Two-Stage Centrifugal Pumps

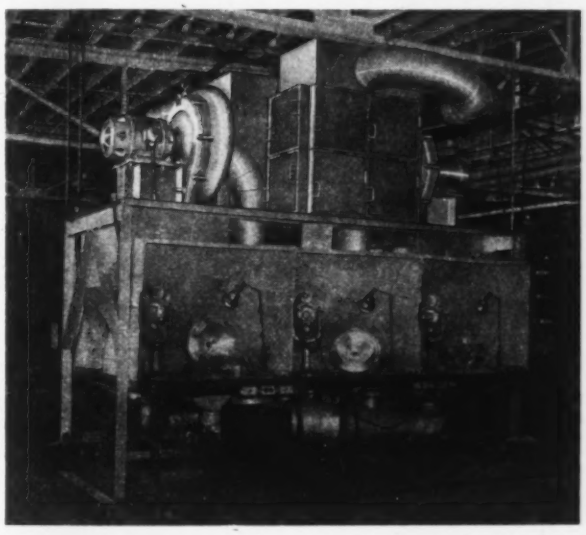
Two-stage centrifugal pumps of the opposed impeller design are described in a 12-page catalog issued by the De Laval Steam Turbine Co., Trenton, N. J. In this type of pump both impellers are of the single-suction type, the suction openings facing outwardly, so that axial thrust is balanced. Only two pairs of wearing rings are required. The casing is so arranged that both the suction

Continued on Page 34

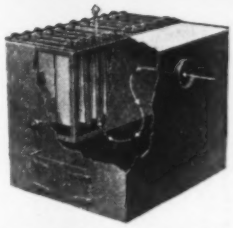
LYCOMING

PROTECTS GRINDING, BUFFING AND POLISHING OPERATIONS WITH

AAF DUST CONTROL SYSTEMS



Standard Type D Roto-Clone combined exhauster and dust separator. Write for engineering data and Bulletin No. 272.



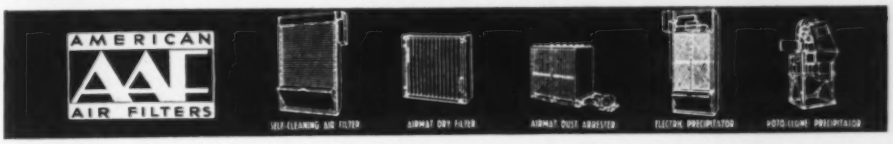
The Airmat Dust Arrester is designed for the collection of fibrous and flaky dusts. Available in all sizes to meet any air volume requirement. Bulletin No. 280.

Thirty-three AAF dust control installations protect grinding, buffing and polishing operations in the Lycoming motors plant. Equipment installed includes Roto-Clone Standard Type D units for belt polishers and grinders in the tool room, Self-Contained Roto-Clones with after cleaners serving Kellerflex grinders throughout the assembly floor, and Airmat Dust Arresters serving buffing operations for finishing connecting rods, master rods, crank shafts, cylinder heads and propeller hubs. There's an AAF product designed for every dust control need.

Write for descriptive bulletins.

AMERICAN AIR FILTER CO., INC.

103 CENTRAL AVE., LOUISVILLE, KY. - In CANADA: DARLING BROS., LTD. MONTREAL, P.Q.



and discharge nozzles are in the lower hall, and all parts of the pump are accessible and can be removed upon removing the casing cover. This type of pump is listed for capacities from 50 gallons per minute to 1500 gallons per minute, and for heads from 80 feet to 800 feet.

Foxboro Instruments

Catalog 95-A, just issued by The Foxboro Co., Foxboro, Mass., is the most comprehensive bulletin the company has ever issued, describing its full line of instruments for the measurement and control of industrial process conditions. The contents have been prepared with great care, for completeness and accuracy, and is organized to make it easy for the user to choose the type of instrument best fitted to his needs. There are over 200 illustrations.

The 48 pages comprise ten sections, six of them grouping and describing all the instruments, accessories, and supplies appropriate to a particular field of application, such as Temperature, Flow, Pressure, Level, Humidity; while the remaining sections cover combination instruments, valves, instrument panels, and similar subjects. Thorough cross-indexing of the contents, plus an ingenious use of colors, makes this catalog a convenient and useful reference handbook of modern instrumentation.

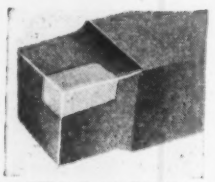
Copies will be sent on request.

Johnny gets his gun . . . Faster

When KENNAMETAL* is in the TOOL POST

Garand rifle tooled by KENNAMETAL

Johnny's gun today—the Garand—is the finest rifle in the world. And it's being machined and rushed to him daily in great unrevealed quantities, in a large manner due to the superior qualities of KENNAMETAL, the steel-cutting carbide.



STYLE 11 TOOL

Machining Garands is just one of the thousands of ways that KENNAMETAL is helping to speed up the war effort.

KENNAMETAL meets the Nation's demand for INCREASED PRODUCTION. For further information, write for Vest Pocket Manual giving detailed information on KENNAMETAL, the superior steel-cutting carbide. Visit the KENNAMETAL Booth C-110 at the National Metal Congress.

KENNAMETAL THE All American CARBIDE

* INVENTED AND MANUFACTURED IN U. S. A.

McKENNA METALS Co.

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Foreign Sales: U. S. STEEL EXPORT CO., 30 Church St., New York
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COMING MEETINGS AND EXPOSITIONS

For the next three months

OCTOBER

1–3	Society of Automotive Engineers, National Aircraft Production Meetings and Aircraft Engineering Display, Hotel Biltmore, Los Angeles, Calif.
5–6	American Gas Association, Annual Meeting, LaSalle Hotel, Chicago, Ill.
7–8	Society of Automotive Engineers, War Transportation and Maintenance Meeting, Hotel Pennsylvania, New York
11–15	Engineering Institute of Canada jointly with American Society of Civil Engineers, General Brock Hotel, Niagara Falls, Canada
12–14	The American Society of Mechanical Engineers, 1942 Fall Meeting, Hotel Sagamore, Rochester, N. Y.
12–15	American Welding Society, Annual Meeting, Hotel Cleveland, Cleveland, O.
12–16	American Society for Metals, National Metal Congress and Exposition, Cleveland Public Auditorium, Cleveland, O.
15–17	American Society of Tool Engineers, Semi-Annual Meeting, Springfield, Mass.
15–17	American Gear Manufacturers Association, 25th Semi-Annual Meeting, Skytop Lodge, Skytop, Pa.
22–23	Society of Automotive Engineers, National Fuels and Lubricants Meeting, Tulsa Hotel, Tulsa, Okla.
27–29	National Safety Council, 31st National Safety Congress and Exposition, Hotel Sherman, Chicago, Ill.

NOVEMBER

9–10	Engineers Society of Western Pennsylvania Third Annual Water Conference, Wm. Penn Hotel, Pittsburgh, Pa.
9–13	American Petroleum Institute, 23rd Annual Meeting, Palmer House, Chicago, Ill.
11–14	Society of Naval Architects and Marine Engineers, 50th Annual Meeting, Waldorf-Astoria, New York, N. Y.
16–17	American Institute of Chemical Engineers, 35th Annual Meeting, Netherland Plaza, Cincinnati, Ohio
30—Dec. 2	American Society of Agricultural Engineers, Fall Meeting, Chicago, Ill.
30—Dec. 4	The American Society of Mechanical Engineers, 63rd Annual Meeting, Hotel Astor, New York, N. Y.
30—Dec. 2	American Society of Refrigerating Engineers, Annual Meeting, Hotel Commodore, New York.
30—Dec. 4	Society for the Advancement of Management, Annual Conference, New York.
30—Dec. 4	15th National Power Show, Exposition of Power and Mechanical Engineering, Madison Square Garden, New York, N. Y.

DECEMBER

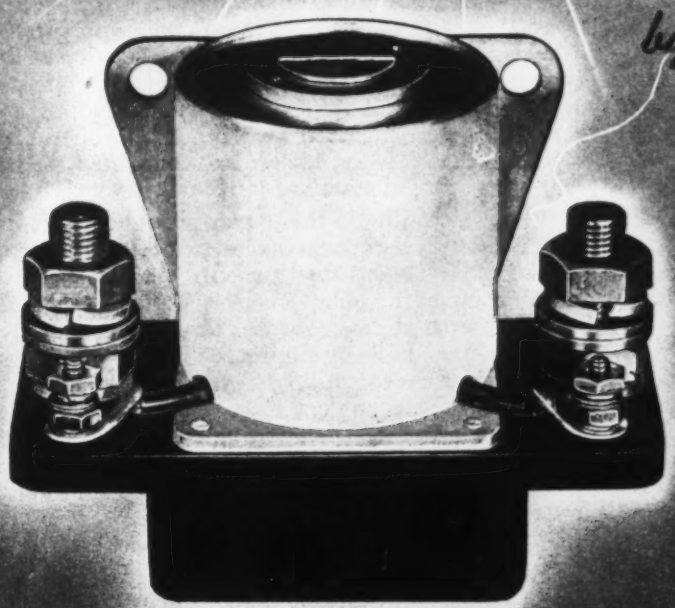
28—Jan. 2	American Association for the Advancement of Science, Annual Winter Meeting, Hotel Commodore, Pennsylvania, etc., New York.

For Calendar of coming A.S.M.E. Meetings see page 754 in the editorial section.

ELECTRICAL AIRCRAFT CONTROLS

DESIGNED TO ARMY AIR FORCE SPECIFICATIONS...

by GUARDIAN



The B-4 Solenoid Contactor

Is your problem the transmission of power for control of aircraft armaments? Aircraft navigation? Aircraft accessory circuits? If so, Guardian has the answer. Units range from a midget relay weighing less than one ounce and capable of controlling 150 watts . . . up to a Solenoid Contactor weighing less than two pounds and handling 200 amperes continuously (at 32 V., D.C.) and 1000 amperes on surges.

We've built single switches. We've built complex electrical assemblies that control machine gun turrets. And the aircraft industry and associate parts manufacturers know from these and hundreds of other units that they can count on Guardian for approved controls—that Guardian has the equipment and the "know how" to do their job right. And, above all . . . they know Guardian's reputation for quality delivery.

Write for our new brochure describing the B-4 Solenoid Contactor and Relays by Guardian.

GUARDIAN ELECTRIC

1619 WEST WALNUT STREET — CHICAGO, ILLINOIS

LARGEST LINE OF RELAYS SERVING AMERICAN WAR INDUSTRY

CLEVELAND OWNERS
give you the Low-down

Positive, Continuous Operation

Vital Then— Indispensable Now

More than 12 years ago an Eastern manufacturer selected Cleveland Worm Gear Speed Reducers for the important drives throughout his large Mill, and now tells us:—

"Cleveland Drives have given positive and continuous operation."

For over 12 years — 24 hours a day — 355 days a year — not just one Cleveland but more than 50 of them have kept this manufacturer's machines in steady production.

Install Clevelands and you will keep *your* machines in steady production too — with assurance of continuous, trouble-free performance through many years to come.

Your Clevelands will never let you down!

The Cleveland Worm & Gear Company, 3264 East 80th Street, Cleveland, Ohio.

Affiliate: The Farval Corporation, Centralized Systems of Lubrication.

In Canada: PEACOCK BROTHERS LIMITED

CLEVELAND WORM GEAR
Speed Reducers

The Standards COLUMN

News of Interest to Manufacturers

Small and Special Types of Steel Rivets

AFTER fifteen years use in industry it has been found necessary to make only a few slight changes and additions in the section of the Introductory Notes dealing with "Physical Tests" of the following two American Standards:

Small Rivets ($^{7}/_{16}$ Inch Nominal Diameter and Under), B18a-1927

Tinners', Coopers' and Belt Rivets, B18g-1928

An Addendum sheet covering these changes is now passing through the approval procedure. This addendum reads as follows:

Page 3, Physical Tests.

Par. (*a*). Delete this paragraph covering Cold Test for Ductility.

Par. (*b*). Change this designation to (*a*) Hot Test for Ductility.

Par. (*c*). Change this designation to (*b*) Hardness Test, and change the wording to read—

Rivets shall show a maximum Rockwell hardness number of B 60 as measured on the side of the shank of the rivet.

It will be recalled that Subcommittee No. 1 which developed these two standards was appointed by the Sectional Committee on the Standardization of Bolt, Nut and Rivet Proportions, B18, in the summer of 1922. By September of that year it had developed a draft of the proposed standard for Tinners', Coopers', and Belt Rivets and by May, 1923 it had completed the first draft of the proposed standard for Small Rivets.

Several drafts of these two proposals were prepared and finally a draft satisfactory to the members of the subcommittee was distributed to industry for criticism and comment. Following this review, these proposals were prepared for vote by the members of Sectional Committee B18 by letter ballot. Approval by the Society of Automotive Engineers and The American Society of Mechanical Engineers in their capacity as joint sponsors soon followed and the proposed American Standards were transmitted to the American Standards Association and approved in the years indicated by the serial designation given above.

The seven other standards developed by Sectional Committee B18 are: Large Rivets, $^{1}/_{2}$ Inch Diameter and Larger, B18.4-1937; Plow Bolts, B18f-1928; Round Unslotted Head Bolts, B18.5-1939; Slotted Head Proportions: Machine Screws, Cap Screws and Wood Screws, B18c-1930; Socket Set Screws and Socket Head Cap Screws, B18.3-1936; Track Bolts and Nuts, B18d-1930; Wrench-Head Bolts and Nuts and Wrench Openings, B18.2-1941.

For further information—Address

The American Society of Mechanical Engineers
29 West 39th St., New York, N. Y.

• Keep Informed . . .

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• NEW EQUIPMENT

Air Conditioning Not A "Comfort" Industry

The action of the War Production Board in asking department stores, theatres, hotels and office buildings with air conditioning equipment above 100 horsepower to "volunteer" such equipment for "active duty" in war production factories should serve to eliminate from the public mind the misconception of air conditioning merely as a "comfort" industry, Dr. Willis H. Carrier, founder of the science of air conditioning and Chairman of the Board of Carrier Corp. asserted today.

"It is seldom recognized that air conditioning had its inception in industry as a production tool. Nor is it common knowledge that the greatly expanded production facilities of Carrier Corporation, and others in the field of air conditioning and refrigeration, are today devoted 100 per cent to production for war industries," Dr. Carrier said.

"Not only is low temperature refrigeration equipment essential to the production of certain types of synthetic rubber, as pointed out by Donald Nelson in his request that stores and others 'volunteer' their equipment, but air conditioning equipment serves a myriad of other war production requirements.

"Air conditioning, for example, makes possible a high degree of accuracy where work to close tolerances is called for. Thus, it helps insure the amazing accuracy of bombsights and firing devices. In addition, air conditioning serves in the production of powder, in the loading of shells, in the production and processing of photographic film, in the manufacture of lenses and fine optical instruments and in countless other ways," Dr. Carrier pointed out.

Woman Machinist Starts at General Electric

One of the first six women to complete the machine shop training course at a Municipal Vocational Training School, Mrs. Alfred Barscz is now operating a universal grinder at a General Electric plant, doing work formerly done by men.

War Emergency Pipe Line Protected from Corrosion by Wrapping with Rust-Proofing Materials

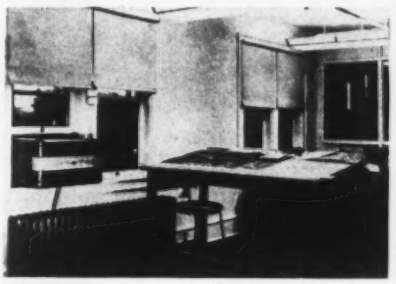
The new 24-inch war emergency pipe line, now being constructed from Longview, Texas, to Salem, Illinois, is the largest-diameter line carrying crude oil ever built and will establish records, both for size and for speed of construction.

Since steel must be conserved by every means possible, it is interesting to note the method employed to protect this underground line from corrosion. The pipe is wrapped with a special asbestos felt, the wrapping being done speedily and with precision by a machine which first applies a waterproofing coating as the pipe revolves.

As stated by Mr. C. J. Van Landeghem, of The Philip Carey Mfg. Co., Cincinnati, Ohio, manufacturer of the asbestos felt used in wrapping this line, "asbestos is a mineral, mined from the earth, and resists the disintegrating forces of earth and water that corrode and decompose many materials which might otherwise be suitable for this purpose." This felt is wrapped by Carey machines leased and serviced by Perrault Bros., Tulsa, Oklahoma. Those interested in protecting underground pipe from corrosion may secure samples of this product by writing the manufacturer.

"Weathermakers" at National Forge

Planning and supervision of high precision war work at the Irvine plant of the National Forge and Ordnance Co. in Warren County, Penna., is being expedited by the installation of twenty-four Carrier Weathermakers which were installed to overcome heat and humidity conditions in the company's offices.



"For many years it has been traditional with National Forge to supply our workers with the benefits of all possible improvements which add to their efficiency while at work," states company President John C. Harrington. "With everyone working at top speed these war times it is particularly important that we keep in as good mental and physical condition as possible."

Seventeen Carrier Weathermakers installed last summer in the National Forge offices proved so successful in increasing efficiency that additional installations were made recently. Every office room at National Forge is equipped with Weathermakers, and the sales, engineering, stenographic, and accounting rooms have multiple installations.

Multi-Purpose 100-Ton HydrOILic Press

A multi-purpose, open-side press designed for widely varying operations in the fields of assembling, pressing, and straightening has just been announced as an addition to the extensive line of HydrOILic presses of The Denison Engineering Co., 1152 Dublin Road, Columbus, Ohio. The press is of 100-ton capacity and is reported to be suitable for either small-lot or production line work. It is designated by its manufacturer as model DLOS2-100.

The frame is of welded steel construction while the cylinder assembly consists of cast steel. The ram is of ground and polished steel fitted with a guide head operating in the ram guides on the inner sides of the press. The unit is available with either a guided platen or a threaded ram.

The maximum stroke of the ram is 18" and the maximum throat opening is 18". Vertical opening is 36". It has a working pressure up to 2,000 lbs. per square inch.

The compact design of the unit is pointed out as being of particular advantage where space is at a premium. Its width at the base is 64 inches, and its depth is 40 inches. The overall unit stands 11 feet six inches high. Its streamlined design, which eliminates sharp corners and projections, is also said to advance safety of operation. Dual control hand tie-up can be furnished to keep the operator's hands fully occupied and out of danger.

The press is readily adaptable for various special operations by means of the alteration of certain key parts. In its operation it utilizes oil for the transmission of power, a principle reflected in the manufacturer's trade name "HydrOILics." Either manual or electrical control is available. Infinitely variable adjustment of the tonnage exerted by the press ram, from approximately 10 tons to full capacity, is afforded by a separate tonnage adjustment control.

New Surface Coating Resin

The Plastics Division of Carbide and Carbon Chemicals Corp., Unit of Union Carbide and Carbon Corp., announces a new and improved type of vinyl resin for corrosion-resistant maintenance finishes and other coating applications. The new resin, identified

Continued on Page 25

Be sure to segregate your alloy scrap

Careful segregation and identification of alloy iron and steel scrap should be standard procedure in every plant collection program.

1. It helps conserve essential, scarce alloying elements.
2. It helps eliminate wasted time, material and effort in the steel mills.

Alloying elements such as cobalt, molybdenum, nickel and tungsten are readily recoverable from scrap. If their presence in a lot is known, the scrap can be used in making up a charge of alloy steel of the same or similar analysis. The amount of alloying elements that must be taken from stock is reduced.

But, if, through lack of segregation, alloy scrap gets into a charge where no alloys are wanted, such as a plain carbon steel, the alloying elements are utterly wasted. It is also possible that the heat itself will be lost because of failure to meet specifications.

The difficulties of scrap segregation increase with every handling. The source is the best point for segregation. Comparatively little time and trouble taken there will save a great deal of trouble and wasted time at the mill.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.
MOLYBDIC OXIDE—BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"

Climax Molybdenum Company
500 Fifth Avenue • New York City

MOLY

as "Vinylite" Resin "VMCH," is characterized by remarkably improved adhesion to a wide variety of surfaces, making possible the formulation of air-dry or low-bake coatings, which possess the same outstanding resistance to corrosive chemicals, to moisture, and to extreme weathering, shown by baked finishes based on the "Vinylite" vinyl chloride-acetate resins.

The new resin is quite similar to the vinyl chloride-acetate resins in most of its properties and differs only in containing a small amount of an additional ingredient that promotes the development of adhesion. It is completely compatible with the other grades, and may be blended with them in actual use.

For years, coatings and finishes based on the "Vinylite" vinyl chloride-acetate resins have been supplied by leading lacquer manufacturers to provide lasting durability, and resistance to weathering and corrosive chemicals. Prepared by dissolving the resins in organic solvents, both clear and pigmented coatings may be applied to metals, concrete, cloth, paper, and other surfaces by dipping, roll-coating, knife-coating, brushing, or spraying. A typical application was the widely used beer can lining which protects the flavor of the beer and is unaffected by alcohol and water.

One characteristic, which has limited the usefulness of these finishes, is their lack of adhesion over impervious surfaces on air-drying. Although they dry solely by evaporation of the solvents, a relatively high-temperature baking operation is necessary to secure maximum adhesion and chemical resistance. When Resin VMCH is incorporated in the formulations, air-drying is sufficient to secure good adhesion and high chemical resistance.

The major field for finishes based on the new resin is believed to be in air-dry coatings for maintenance work, for coating industrial buildings and equipment exposed to very corrosive atmospheres, for coating and lining storage tanks to hold petroleum products, acids, alkalies, or other corrosive materials, and for coatings that must withstand prolonged water soaking or extreme weathering conditions. Test finishes based on Resin VMCH show excellent performance over magnesium and aluminum alloys, particularly on salt water immersion.

Clear paper coatings containing Resin VMCH show improved adhesion to oil-base inks and to many types of papers. A particularly interesting application of Resin VMCH is its use with high-melting paraffin wax as a moisture-resistant coating for glassine or parchment papers for packaging food products. Clear emulsions may be prepared readily, and coatings prepared from them show excellent adhesion to many surfaces, suggesting their use as sealers for alkaline composition board, for smooth plaster, brick, or cement surfaces, where less alkali-resistant sealers of ten break down rapidly.

Relatively small proportions of Resin VMCH included in baking finishes based on the other vinyl chloride-acetate resins permit excellent adhesion to be obtained at lower baking temperatures. For this reason, Resin VMCH should find application in metal finishes, such as sanitary coatings, metal decorating finishes, and coatings for metal foils, where bakes at 275 to 325 deg. F. are practicable.

Lincoln Electric's Nation Wide Survey Shows Larger Electrode, Speeds War Production and Reduces Cost

Use of larger electrodes in arc welding is giving new impetus to war production in many factories and shipyards throughout the United States.

In many instances, welding operations vital to this country's war effort, have been speeded up as much as 50% by the use of electrodes one or two sizes larger. In one instance, the increased speed amounted to 200 per cent, with the aid of improved jigs and fixtures.

This was disclosed today in a nation wide survey conducted by The Lincoln Electric Co. of Cleveland, world's largest manufacturer of arc welding equipment. The survey was made to determine the response of users of arc welding to the company's appeal that welders use larger electrodes in the interest of the war effort as well as efficiency.

Responding to The Lincoln Electric Co. survey, Robert Proctor, chief engineer of the Commercial Shearing and Stamping Co., Youngstown, Ohio, said that some of the company's arc welding methods, including the use of larger electrodes, helped it recently to win the Army and Navy "E" award for production. Use of larger electrodes increased welding speed from 40 to 55 per cent at the company.

"We quite naturally were highly pleased with this award and since we feel that some of our arc welding methods materially aided us in winning this recognition, we would like to pass these on to others hoping that they may help the war effort," Proctor said.

"The use of the largest electrodes possible for each type of fabricated job is imperative if maximum production is to be obtained. For example, a $^3/_8$-inch fillet weld on $^1/_2$-inch mild steel plate formerly welded with $^1/_4$-inch electrode, at 40 feet per hour of arc time, is now done with $^3/_8$-inch electrode at 95 feet per hour of arc time. This increased our arc

Continued on Page 26

Unseen BUT Effective

The DE LAVAL **IMO** PUMP

within the oil reservoir here shown is driven by the 7200 rpm. motor to supply pressure oil for hydraulic controls. The simplicity, compactness and lightness of the IMO pump, as well as its high efficiency, recommend it for many uses where rotary pumps are desirable but have heretofore proved too cumbersome. The IMO is also used as an hydraulic motor.

Ask for Publication I-97

IMO PUMP DIVISION
of the De Laval Steam Turbine Company
Trenton, New Jersey

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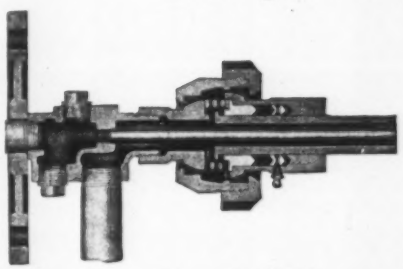

Type 7R-8CR
with
Adapter 18R

Two Ball Seats *provide* Flexibility, Eliminating Strain on the Revolving Sleeve

Heat or Cool Rotating Rolls at Lowest Maintenance Costs

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In Canada—The Holden Co. Ltd.

Write for Catalog

Industry's Debt To Sir Robert Hadfield

Amsco and other producers of 13% manganese steel are able to make for industry today "the toughest steel known," because a young Englishman in the early 1880's possessed the patience and persistence that go with genius. That youth was Robert Abbott Hadfield, later Sir Robert Hadfield, known to metallurgists as "the father of manganese steel."

Courtesy "British Steelmaker"

His father was a foundry owner and a pioneer in producing steel castings on a large scale. Young Hadfield entered his employ in 1875 and his own important researches date from that time. While trying to find a hard and yet tough steel for tramway car wheels, where the metal was subject to heavy pressure and abrasion, he discovered manganese steel.

His experiments in 1882 developed that 13% manganese steel became *tough* instead of *hard* upon quenching after suitable heating, and that in spite of its high iron content it was practically non-magnetic and a relatively poor conductor of heat and electricity. At about the same time, Hadfield discovered silicon steel; and twenty years later brought out the ow hysteresis silicon steel now widely used in transformers and other electrical devices.

If Sir Robert Hadfield had produced nothing but manganese steel, his name would still ring in history as a benefactor of mankind, for this "toughest steel known" made possible engineering undertakings thitherto impracticable.

Austenitic 13% Manganese Steel, by insuring genuine economies and continuous production in the heaviest shock and abrasion services, is making a real contribution to America's war production.

It can give such exceptional performance under the most punishing conditions, because—

Manganese Steel has high tensile strength and ductility, and an unequalled work-hardening property.

Manganese Steel has an extremely cohesive grain structure known as austenite, acquired from the heating and quenching process, which gives it a toughness unmatched by any other commercially produced steel.

Manganese Steel resists shock stresses because of its toughness, and still yields or deforms locally under heavy impact instead of breaking. Deformation is not continuous, for cold-working raises the yield strength in stressed areas.

Manganese Steel is used wherever metal is required to combat abrasion combined with heavy repeated impact, resisting breakage far better than ordinary steel and having a wearing life from two to ten times as long.

Manganese Steel is used with established economy as equipment parts in industries such as cement, clay products, coke and iron, construction, dredging and excavating, foundry, glass, logging, mining, petroleum, quarry, sand pit, steel and others.

Amsco engineers will gladly advise you on how best to adapt this unique and useful metal to your needs.

Amsco

AMERICAN MANGANESE STEEL DIVISION
OF THE AMERICAN BRAKE SHOE & FOUNDRY CO.
Chicago Heights, Illinois

Manganese Steel Castings for shocks and abrasion.
Chromium-Nickel Alloy Castings for heat and corrosion resistance.
Power Shovel Dippers. Dredge and Industrial Pumps.
Welding Materials for reclamation and hard-surfacing.

FOUNDRIES AT CHICAGO HEIGHTS, ILL.; NEW CASTLE, DEL.; DENVER, COLO.; OAKLAND, CALIF.; LOS ANGELES, CALIF.; ST. LOUIS, MO. OFFICES IN PRINCIPAL CITIES

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time efficiency from 40 per cent with 1/4-inch rod to 55 per cent with 3/8-inch electrode.

"A 1/4-inch fillet on a 3/16-inch plate, formerly welded with a 3/16-inch electrode at 8 inches per minute arc time, can be accomplished with 1/4-inch rod at 14 inches per minute arc time.

"By proper handling of the electrode, these larger sizes give excellent results even though the first attempts often appear discouraging."

Also to cut welding time in the nation's factories, The Lincoln Electric Company has introduced the "Fleet-Fillet" technique, which in many instances has increased welding speeds as much as 100 per cent.

Experimenting with larger electrodes, some concerns found that they can be used on thinner metal, than they had previously suspected. The 3/16- and 1/4-inch electrodes were used on metals as light as 1/8-inch in thickness.

Use of larger electrodes also have a tendency to cut down the number of passes necessary to make a weld. In many instances, learners on welding jobs are able to do satisfactory work in shorter apprenticeship time, manufacturers discovered.

The highest increase in welding speed—200 per cent—was reported by a manufacturer of belt reels. This increase occurred in shifting from 1/8 to 5/32-inch electrodes and improving the set-up of the welding job.

Savings in cost ranged upward to 60 per cent, which was reported by a pipe manufacturer. A company making tractor idler rollers reported a 50 per cent saving.

An analysis of saving achieved was made by Electric Machinery Manufacturing Co. of Minneapolis, Minnesota. Welding of stator frames in a horizontal position with 3/16-inch "Fleetweld 7" electrodes, required three passes. When a change was made to "Fleetweld 9" 1/4-inch size, the same weld could be made in one pass with a 30 per cent saving in cost. A total saving of 43 per cent was achieved when, in addition to using larger electrodes, the company welded the stator frames in a welding positioner, which permitted downhand welds.

The Food Manufacturing Co. of Lakeland, Florida, making an amphibian tractor, analyzed the savings made on welds on the stern and catwalk. The stern has 132 feet of welding, which were formerly done with 5/32-inch electrodes. The time required was six hours. Shifting to a 3/16-inch electrode the time was cut to 4 hours. Thirty minutes per 140-foot unit of structure was saved when a shift was made in welding catwalks.

Other companies reporting increases in welding speeds through use of larger electrodes are: Teleweld, Incorporated of Chicago, structural and penstock welding, 100 per cent; Stevens Metal Products Company, Niles, Ohio, 150 per cent; Aetna Iron and Steel Company, Jacksonville, Florida, 73 per cent; Downingtown Iron Works, Downingtown, Pennsylvania, 22 per cent; Allith-Prouty, Incorporated, Danville, Illinois, 66 per cent; Butler Manufacturing Co., Kansas City, Missouri, 20 per cent; Clyde Iron Works, Incorporated, Duluth, Minnesota, 15 per cent; Calvert Iron Works, Incorporated, Atlanta, Georgia, 15 to 20 per cent; and St. Paul Structural Steel Co., St. Paul, Minnesota 66 per cent.

Air Conditioned Recreation Building

Bowlers who match skills in the newest and largest bowling alleys in Denver, Colorado, are now ringing up better scores and enjoying more comfortable atmosphere since the Centennial Recreation and Bowling Company installed a Carrier air conditioning system of 20 ton cooling capacity.

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The bowling and recreation building, largest such building in Denver, was remodeled from an original 10-alley layout built in 1940 to the present 16-alley size, including a new parallel wing to provide extra space. Operating on a 24-hour schedule for defense workers in nearby munitions and ordnance plants, the Centennial alleys have been busy at top capacity since the remodeling and recently sponsored a summer bowling league which efficient air conditioning alone made possible.

The Carrier system was installed to replace an evaporative type cooling system which had been previously installed in 1940. The evaporative system proved inadequate from the outset, according to the Centennial management. Bowlers complained of an oppressive sensation after a few moments in the blast of water-laden air across the foul line, and women bowlers complained that their hair lost curl and became stringy during an hour's bowling time. Veteran bowlers found their favorite balls damp and slippery after a few hours of evaporative cooling and refused to play with balls exposed to the atmosphere overnight.

Solution to all these problems, which had held back play in the alleys for several months, has been found in the Carrier installation.

Ordered prior to Pearl Harbor, it is one of the last such "comfort" installations for the duration, providing cooling, dehumidifying, air circulation, filtering and outside air for ventilation during the summer months. During the winter, it provides humidification of air along with circulation, filtering and ventilation.

The entire building, including men's and women's locker rooms, a large vestibule soda fountain, and the foul line-spectator section and alleys, is air conditioned.

The equipment is installed on the roof of a room behind the pinboy runway at the rear of the building, and in the attic above. It was necessary to build the extra room inasmuch as the building had been originally planned for roof-type evaporative coolers, without a basement.

The system distributes 8000 cfm of cooled air throughout the building via a transverse duct over the alleys and approximately 20 feet from the foul line. Supply and return ducts are both at this location, with the supply duct above. The eight return air grilles are mounted near the ceiling and between the eight supply grilles. Carrier grilles were worked neatly into the decoration of the duct work, and are not easily seen.

One small takeoff duct runs from the main traveler duct to the soda fountain, located in the entrance to the building, cooling this area by means of a single ceiling diffuser. A large percentage of the cfm is delivered here to give an immediate cooling effect to customers entering the building. Grilles serving the spectator and foul line section can be dampered if wished in the event that only one-half the building is occupied. However, the demand for alleys has been such that all are in use almost hourly over the night and day.

Outdoor air controls are installed at the checking and score desk in the center of the alleys, where a supervisor may admit ventilation air at option from 0 to 100%, depending upon the number of bowlers in the alleys, predominance of smoke, etc. Four 5000 cfm exhaust fans are located in the ceiling over the spectator chair banks to exhaust smoke rapidly when needed.

Play has doubled since this air conditioning system was installed, according to the Centennial management.

Adjustable Screws on Tightener Pulleys Increases Belt Life

To keep guiding tightener pulleys on the top of sensitive drill presses in line, and thus lengthen the belt life, a scheme has been devised where adjusting screws replace the flat steel springs for retaining these pulleys in position.

To use the adjusting screws, it is only necessary to drill and tap a hole through the spring retainer stud. The belt is run over the pulleys in the conventional manner with the pulleys allowed to take whatever position they will. The set screws are then run down tight and locked in place by means of a lock nut.

The pulleys cannot shift from their position unless the screws are loosened. In this manner, the belt is made to run true and its life is considerably lengthened.

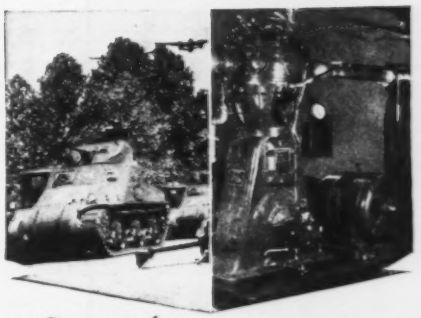
Westinghouse Turbine Production Doubled Since Pearl Harbor

Production of propulsion equipment for naval vessels and turbines for land powerhouses at the Westinghouse Steam Division has more than doubled in the last ten months, as compared with the ten months preceding Pearl Harbor. This information was given to the Board of Directors by Mr. A. W. Robertson, Chairman.

In the ten months preceding Pearl Harbor, deliveries made by the Steam Division amounted to $23,998,000. In the ten months since Pearl Harbor, deliveries totalled $50,356,000, an increase of 109 per cent.

In virtually the same period, Mr. Robertson pointed out, Westinghouse has built,

Continued on Page 28



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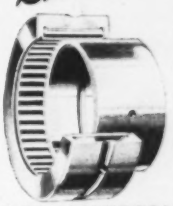
PRECISION BEARINGS

Fighting equipment — as well as production machinery, will deliver more and faster with McGILL Bearing precision and dependability.

Equipment designers request the precision built into McGILL Bearings to help insure effective operation, longer life and uniformly accurate production. Bearing selection is doubly important today. Depend on McGILL.



Solidend *MULTIROL* Bearing

Maximum Capacity Ball Bearing

BEARING DIVISION
1100 No. Lafayette St.

McGILL MANUFACTURING COMPANY, INC.
VALPARAISO, INDIANA

Diesel Oil ADDITIVES *Stay in* when NUGENT FILTERS *are used*

THE name NUGENT on an oil filter means that this filter will *NOT* remove the special additives put into the original oil during refining processes nor change the original composition of the oil. That's why leading Diesel engine manufacturers and principal oil companies advocate the use of NUGENT Patented OIL FILTERS!

No chemicals or diatomaceous earth are used in the filtering mediums of NUGENT Filters, because these materials may remove the very ingredients the oil companies have experimented with for years to put in their oils to enhance their lubrication qualities. Now that they have attained this high degree of efficiency, which prevents gumming, sticking rings and formation of engine varnish, it would be ruinous to use an improper filter. It has been found that the use of improper filters change the chemical structure of some oils so as to destroy the adherence as well as cohesion of the oil on the bearings; in other words, allowing metal to metal contact.

Write for complete information on NUGENT Filters for fuel and lubricating oil.

SPECIFY NUGENT FUEL and LUBE OIL FILTERS for your DIESELS. Available in 7 sizes, from 1 to 130 G.P.M.

WM. W. NUGENT & CO., INC., Established 1897
407 N. Hermitage Ave., Chicago, Ill.

SAUERMAN

Polaroid*... *Photoelastic Polariscope for Stress Determination

To the machine designer, photoelastic stress analysis is not only of value in the verification of calculations based on theoretical solutions, but also in the solution of problems where theoretical analysis is not available. Where weight and space must be conserved actual stress distribution is more important than stress indicated by theoretical analysis.

In the new model polariscopes of 4¼" and 6¼" clear aperture, the parallel beam is collected by a rear element and condensed through a three component lens of the Cooke system. In the new larger units (8¼" and 10" aperture) a four component lens of the Omnar system is used. In both cases, *the image is sharp throughout the field, free of aberration, astigmatism and distortion.*

Literature of new model polariscope now available

POLARIZING INSTRUMENT CO.
630 Fifth Ave., New York, N. Y.

*T. M. Reg. U. S. Pat. Off. by Polaroid Corporation

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equipped and put into operation the $26,000,000 Merchant Marine Division Plant.

The directors were also informed that the whole Westinghouse Company which has plants in more than 25 cities, would produce this year more than $500,000,000 worth of equipment. It is now producing at the rate of 4,000 carloads of war materials a month, or a carload every 11 minutes.

At an informal gathering in advance of the regular board meeting, Mr. L. E. Osborne, Vice President in charge of the Steam Division, and Mr. Ellis L. Spray, Manager of the new Merchant Marine Division, explained the operations of their respective plants to the directors. Mr. Osborne reported that the Steam Division this year would deliver nearly $70,000,000 worth of equipment—approximately four times the Division's normal peace time annual production.

Factors contributing to the Steam Division's record production, Mr. Osborne told the directors, were a 29 per cent increase in employment, a $13,000,000,000 expansion program, and the help of more than 50 other manufacturers who are building equipment for the Division under sub-contracts totalling nearly $20,000,000.

To obtain many of its new employes, the Steam Division has trained more than 2500 workmen, Mr. Osborne said. Included in the cost of the expansion program was the purchase of 1100 new machine tools, and the rearrangement of existing tools to speed the flow of turbine parts to assembly workmen.

Current production, Mr. Osborne continued, includes turbines and gears for naval vessels of many types, propulsion equipment for war-cargo ships, and powerhouse turbines for the generation of war-needed electricity. Concentration on marine propulsion equipment has enabled the Steam Division to put many of its manufacturing operations on a quantity production basis.

Mr. Spray, explaining the operation of the new Merchant Marine Plant, disclosed that this plant soon will deliver at least four months ahead of schedule its first complete ship propulsion unit, consisting of high pressure turbine, low pressure turbine and driving gears.

Four months after this delivery, production will reach contract capacity, although construction and tooling of the 14-acre plant will not be completed until next Spring. By September of next year, production should increase one-third over contract capacity.

"We are not only beating our production schedule, but in addition are building some of our own machine tools," Mr. Spray explained. He added that this was necessary because machine tool builders were unable to deliver on time some equipment urgently needed for the new plant. More than 350,000 man-hours were diverted to this work.

Pointing out how new facilities had been used to the utmost as acquired, Mr. Spray recalled that the first machine tools were moved into the new plant only four and one-half months after ground was broken, and that productive work was started a few weeks later.

In addition to building many of its own machines, the new plant trained more than 50 per cent of its employes. Seventy-five per cent of the supervisors who conducted this training program were recruited from other Westinghouse plants and brought Westinghouse "know-how" to their new posts.

Ten members of the Westinghouse Board of Directors, in addition to Mr. Robertson, attended the meeting, which took place at the South Philadelphia plant. They included: George A. Blackmore, president, Westinghouse Air Brake Co.; George H. Bucher, president, Westinghouse Electric & Manufacturing Co.; Robert T. Swaine, Cravath de Gersdorf, Swaine & Wood; F. A. Merrick, vice-chairman, Westinghouse Electric & Manufacturing Co.; Arthur W. Page, vice-president American Telephone and Telegraph Co.; Thomas I. Parkinson, president, Equitable Life Assurance Society; Paul J. Myler, chairman Canadian Westinghouse Co., Ltd.; Roscoe Seybold, vice-president and comptroller, Westinghouse Electric & Manufacturing Co.; George M. Verity, chairman, American Rolling Mill Co.; and H. S. Wherrett, president, Pittsburgh Plate Glass Co.

Jenkins Bros. Contributes 40,000 Pounds of Salvage

Anticipating Manhattan's metal salvage drive October 15th, workmen were busy in the courtyard of the Jenkins Bros. New York offices at 80 White Street. They were cleaning out the scrap metal which had accumulated over the years. Frederick C. Ernst, Jenkins Bros. chief engineer said the valve manufacturing concern's salvage in New York would be over 40,000 pounds. The

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RATE Announcements under this heading in MECHANICAL ENGINEERING are inserted at the flat rate of $1.25 a line per issue. $1.00 a line to A.S.M.E. members, minimum charge, three line basis. Uniform style set-up. Copy must be in hand not later than the 10th of the month preceding date of publication.

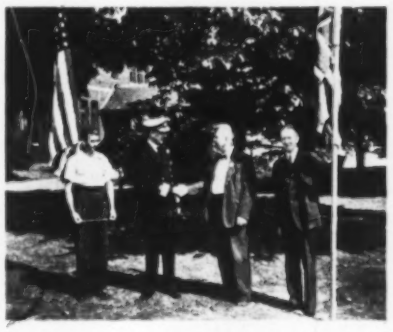
• Keep Informed

salvage includes an old discarded passenger elevator complete with cables, some iron railings, about a mile of steampipe, two large old electric motors, and a huge horizontal tubular boiler with firebox and grates.

The boiler, which was installed fifty or sixty years ago, was enclosed behind a brick wall which had to be torn down before the men could go to work. Illustration shows Frederick C. Ernst, chief engineer of Jenkins Bros., manufacturers of valves, applying the blow torch to the huge old boiler. Bob Gause, a rigger, of Elmhurst, Long Island, who used to load scrap iron on ships bound for Japan until the embargo of 1940, is cutting the boiler up into sections with his blow torch.

Mr. Ernst estimates that the Jenkins Bros. contribution to the metal salvage drive will furnish Uncle Sam's fighting forces with 80 one-ton aerial bombs, or 320 3-calibre machine guns, or 80,000 hand grenades.

Rear Admiral E. J. O'B. Croker R.N. Pays Foxboro Company Official Visit



Foxboro, Mass., Sept. 23. In the presence of a large audience of the company's employees, Rear Admiral E. J. O'Brien Croker, R.N., chief of the British Admiralty Technical Mission, at Ottawa, Canada, paid tribute to the part which men and women of The Foxboro Co. are contributing to the successful campaigns of the Allies at sea. The Foxboro Co., in addition to its regular work of producing industrial instruments of measurement and control, is separately engaged in work of a confidential nature in which the Royal Navy has reason to be interested. It was in this connection that the Admiral made his visit to Foxboro, Mass., to express official thanks for the past and present accomplishments of the company's employees, and to encourage each man and woman among them to strive for still greater production.

"Let me remind you," he said, "that almost within sight of the British Isles stretch 4000 miles of hostile shore, all the way from the Arctic Ocean to the Bay of Biscay. But with every-increasing production of weapons, of such quality as you are helping to create, you are hastening the glorious day of an Allied victory and the world's return to peace."

Continued on Page 30

AVOID this Costly Valve Leakage

AREA OF LEAK	AIR		STEAM		WATER	
Diameter Inches	Number of cubic feet per month at 75 lb. pressure	Total cost of waste per month 11c per 1000 cubic feet	Pounds wasted per month at 160 lb. pressure	Total cost of waste per month 65c per 1000 lb.	Gallons wasted per month at 60 lb. pressure	Total cost of waste per month 16c per 1000 gallons
1/2"	13,468,000	$1,481.44	1,219,280	$792.53	1,524,100	$243.86
3/8"	7,558,500	831.44	684,290	444.79	855,360	136.86
1/4"	3,366,990	370.37	304,820	198.13	381,020	60.96
1/8"	824,570	90.70	74,650	48.52	93,310	14.93
1/16"	213,000	23.43	19,280	12.53	24,110	3.80
1/32"	52,910	5.82	4,790	3.11	5,990	.96

Enlarged copies of this chart available on request; also Lunkenheimer Catalog 78.

Valves aren't so easy to replace these days . . . practically all materials going into their manufacture are on the critical list. This means that it is up to every valve user to take the best care of what he has to insure the longest possible service life.

Leaky valves are saboteurs of your production schedules . . . obstructing your best efforts and increasing your costs. The chart illustrated above gives you an idea of what valve leakage costs you.

Fortunately, valves respond to good treatment. Careful handling, immediate repair of the slightest leaks, and prompt replacements of worn parts will keep them on the job, ready to meet the demands imposed by industry's unprecedented war effort.

Since virtually all materials used in the manufacture of valves are on the list of critical materials, valve users are urged to furnish the highest possible preference ratings and proper "end use" symbols on their orders. This will be of mutual helpfulness.

ESTABLISHED 1862

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• Keep Informed . . .

Admiral Croker was introduced by Mr. Edgar H. Bristol, President of The Foxboro Company, and spoke during an intermission in an noon-hour concert of The Foxboro Company Brass Band. As the two men crossed the lawn where the weekly band concerts are held, the audience rose and burst into applause of welcome. The band concluded its program of patriotic music with "God Save The King" and "The Star Spangled Banner." Following the ceremony an informal committee of more than a dozen employees who are of British origin greeted the distinguished visitor.

"V Depends on Me"

"V Depends On Me" is the war-workers' slogan for which an inspector, John T. Nevitt, Jr., is shown here receiving from C. S. Redding, President of Leeds & Northrup Co., the first-prize war bond in a production-slogan contest for L&N employees.

This contest was one of the activities of the Joint Labor-Management Committee, which Leeds & Northrup set up immediately after the War Production Board suggested such committees for all plants producing war goods. The contest produced over 65 entries for every 100 employees. Promotion material consisted of posters on bulletin boards, and pay-envelope enclosures. In addition to first and second grand prizes, there were first prizes in war bonds for each departmental group of less than 100 persons, and both first and second prizes for groups of over that number. Contest was open to employees only.

Army-Navy Flag for National Forge

The recent presentation of the Army-Navy Flag to National Forge & Ordnance Co., Irvine, Warren County, Pa., marks the fourth award this company has received for excellence in production in less than a year.

National Forge was first honored for such meritorious effort by the Navy Ordnance "E" pennant on Nov. 22, 1941. This was followed by the All Navy "E" burgee on April 17. Then came the first White Star on May 23, signalizing the maintenance of award winning standards for the six months following the first "E."

As a result of having already won the White Star, National Forge was privileged to add it to its Army-Navy Flag the day it was first unfurled at the plant. Thus National Forge is one of the few companies to have a White Star on its Army-Navy Flag at the time of presentation.

Pictures Tell Story

As a follow-up on the award of the Army-Navy E pennant to Jenkins Bros. last month, a booklet telling the story of the ceremonies incident to the award is being distributed to all employees at the Bridgeport, Conn. plant, where the award was made. The book is oversized, (10 × 13 inches), and recounts the events of the day of the ceremony in picture form. Text captions are brief; more than 50 pictures are used in the 16-page employees souvenir.

• BUSINESS CHANGES

1942 Power Show at a New Location

Transfer of the 15th National Exposition of Power and Mechanical Engineering to its new location in Madison Square Garden has been successfully accomplished. Continuously increased interest in recent weeks proves the Exposition to be fulfilling many new found needs.

The Exposition is to be held November 30 to December 4th in the Exposition Hall of the Garden, which permits all exhibits to be staged on one floor. A special entrance has been provided through a new lobby on 49th Street, just west of Eighth Avenue, giving separate and direct access to the Show at all times.

The business office of the Show, including the booking of space and completing arrangements for handling the displays, however, remain at permanent offices in Grand Central Palace, where the former exposition floors only have been taken over by the Army for an induction center. This is the headquarters of the International Exposition Co., under whose management the Exposition is conducted.

Recognized for twenty years as a national market for the newest products of research and invention in power and mechanical engineering, the Exposition this year has been organized for the special purpose of contributing to the Nation's war effort by concentrating at one time and place equipment,

It's CHEAPER to PREVENT Explosions

Inert gas for blanketing, purging, agitating, drying, etc., is the modern method of explosion prevention wherever inflammable gases or liquids are treated, stored or handled. A Roots-Connersville Inert Gas Generator is the economical means of producing this gas for direct use or storage. Portable or stationary units.

Any firm which can extend the high priorities required by present regulations should consider future needs now, as war-time demands are lengthening deliveries.

ROOTS-CONNERSVILLE BLOWER CORP.
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High Pressure Inert Gas Generator installation at Eastern Chemical plant. Capacity 1,000 CFH, using 530 BTU gas as fuel.

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INERT GAS GENERATORS for Low Cost, Safe Purging & Processing

information and the mental resources needed to maintain and increase power production and to use it more efficiently.

Heretofore the Exposition, which is a biennial event, has been a means of introducing new products and improvements in power plant equipment. Now its uses are considerably broadened by wartime conditions.

There is every indication that the attendance will be substantial and the rewards of information and ideas large, justifying the co-operative spirit of the exhibitors in making the Exposition to serve more than ever as an educational and informational institution at this critical time.

Throughout the Exposition the war production will be the dominant note. Quite a number of the exhibits feature action.

The Exposition will open Monday at 2 P.M., daily thereafter at 11 A.M. The closing hour will be 10 P.M. every day except Friday, when the Show will close at 6 o'clock P.M.

Kropp Forge Appointments

In keeping with the necessity for added executive personnel for the new subsidiary company, Kropp Forge Aviation Co, the Kropp Forge Co. announces the addition of several executives and the appointment as vice-president of a former sales engineer

J. E. White, former vice-president of the R. C. Larkin Co., Chicago (tractor equipment), has been appointed Project Manager and charged with the duties of construction of the new plant. For many years Mr. White was with the Illinois State Highway Department, later with the Shell Petroleum Corp. in a construction capacity, followed by eleven years in purchasing, production and sales of construction machinery for the Continental Roll & Steel Foundry Co. When that company's construction machinery division was sold to the Gar Wood Industries, Mr. White, still in a selling capacity, transferred his activities to Detroit, from where he later moved to the Chicago territory with the Larkin Co. A native of Ottawa, Ill. he has spent many years in the construction and heavy engineering side of industry and brings to Kropp Forge and its subsidiary aviation company a broad experience in construction and production.

J. H. Lund, who for the past several years has been in the Kropp Forge sales organization, has been appointed vice president of the company. A graduate of the University of Illinois, Mr. Lund has devoted his energies to sales engineering: first with the Illinois Bell Telephone Co., then with the Rockford Drop Forging Co. and latterly with Kropp Forge. Since the emergency, he has been in full charge of priority selling and has devoted his time particularly to the organization of aviation forging sales, having effected a standardization group production plan which has well served many airplane manufacturers in production on similar equipment. A native of Chicago, Mr. Lund is prominent in fraternal activities, past President of Alpha Tau Omega and active in the Inter-Fraternity Club.

Another recent addition to the expanding personnel of Kropp Forge is Budd H. Gebhardt, graduate of Northwestern University where he majored in factory management. Immediately upon his graduation in 1934, he joined the staff of the Woolworth Co. in the position of management advisor for the Chicago office. In 1940 he went to the Goss Printing Press Co. as production engineer handling government naval contracts. His addition to the Kropp organization as production engineer will aid in their large expansion program now underway.

I. G. Moore has been added to Kropp Forge Co.'s staff in the position of Personnel Promotion Director, his duties to be the handling of employee relations, War Bond sales, internal company personnel activities, etc., in a new department just recently created. A graduate of the University of Chicago and native of Chicago, Mr. Moore for the past fifteen years has been associated in a promotional and editorial capacity with various trade publications and association magazines.

Westinghouse Man Transferred

A. E. Hitchner, former manager of the Los Angeles office of the Westinghouse Electric & Manufacturing Co., has been appointed assistant to the manager of the Company's industry sales departments with headquarters at the East Pittsburgh works, it was announced by F. H. Stohr, manager.

Joining Westinghouse in 1909 as a salesman in the Middle Atlantic District, Mr. Hitchner served from 1919 to 1926 as assistant to the manager of the industrial department at East Pittsburgh. In 1926 he was appointed manager of the Los Angeles office and in 1941 commercial assistant to the Pacific Coast District manager.

Born in Clayton, N. J., December 11, 1882, Mr. Hitchner attended West Jersey Academy

Continued on Page 32

FASTENINGS YOU CAN TRUST

1. Application is fast and fool-proof...
Their locking action is immediate and automatic . . . no pins, no washers, nothing to forget.

2. Grip is positive, yet resilient...
Threads of nut and bolt are held in contact under constant cushioned pressure. The nuts stay put.

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Made of non-metallic, non-fatiguing material, it cannot be broken down by vibration or prolonged hard service.

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WITH THE RED LOCKING COLLAR . . . SYMBOL OF SECURITY

at Bridgeton, N. J., and received a bachelor of science degree in electrical engineering at Rutgers College in 1904. At Rutgers he played on the football and baseball teams and served as captain of both squads during his senior year.

Mr. Hitchner lives at the University Club in Pittsburgh.

Davis Elected Vice President of Foote Bros. Gear & Machine Corp.

Foote Bros. Gear and Machine Corp., Chicago, Ill. announced the election of Russell G. Davis to the vice presidency of that company at a recent meeting of the Board of Directors. Mr. Davis will continue in his capacity of General Manager of the Industrial Gear Division.

In line with the recently vastly increased business of this company, a number of promotions are announced in the Sales Department, F. A. Emmons is now Assistant General Manager; R. B. Moir is Manager, Sales and Engineering, W. H. Ostring, Special Representative; Galen Butterbaugh, Speed Reducer Sales; T. F. Hill, Gear Sales; Charles Look, Assistant Gear Sales.

Chamberlain Named Jenkins Sales Manager

Charles C. Chamberlain has been named as general sales manager of Jenkins Bros., Bridgeport, manufacturers of valves and other products, according to announcement by Farnham Yardley, president of the company. Mr. Chamberlain has been publicity manager of Jenkins Bros. since 1940. Mr. Yardley's announcement followed a meeting of the board of directors of the company.

Mr. Chamberlain came to Jenkins Bros. in 1929, on graduation from Hamilton College. Starting as an assistant in the advertising department he was appointed advertising manager in 1932, and advanced to publicity manager in 1940. A native of Malone, New York, he resides in Pleasantville, N. Y.

The new general sales manager will make his headquarters at the general offices of the company, 80 White Street, New York, N. Y.

• LATEST CATALOGS

G-E Arc-Welding Accessories

"Arc-welding Accessories" is the title of an attractive new 32-page bulletin (GEA-2704B) recently issued by the General Electric Co.

Profusely illustrated throughout, the bulletin presents a most complete line of General Electric accessories, all designed to make arc-welding safer and easier.

Among the listed items, which are completely specified and described in detail, are: goggles, observation shields, ventilated head protectors, chrome-leather protective clothing, flame-proofed welding screens, ultra-violet-ray protective paint, metal and carbon electrode holders, clamps, cable connectors, brushes, chippers, electrode carriers, and fillet-weld gages.

Also listed is General Electric's 200-page arc-welding manual. A price list and order blanks accompany the bulletin.

Centrifugal Pumps

What is considered to be one of the most compact compilations of facts ever issued on a complete centrifugal pump line, Bulletin B6059-H, has just been released by the Allis-Chalmers Mfg. Co.

The variety of emergency wartime applications has been kept in mind in preparing the concise descriptions, charts and diagrams in the new book. Construction features, sizes and capacities are listed in a manner which simplifies the choice of proper pumping equipment for specific needs.

Included in the bulletin are pump types for every purpose—single and double suction, single and multi-stage, mixed and axial flow, combined Allis-Chalmers units and special pumps to solve special problems. Recommended applications for the one-package pump unit, the Allis-Chalmers Electrifugal, are also included.

Centrifugal pump users can now obtain copies of this new book by writing Allis-Chalmers, Milwaukee, Wis.

Standard Steels Data Card

A complete combined list of standard steels of the American Iron and Steel Institute and the Society of Automotive Engineers, Inc. has been issued by The Babcock & Wilcox Tube Co., as a new Technical Data Card.

For a copy, write The Babcock & Wilcox Tube Co., Beaver Falls, Pa., on your company letterhead. Ask for TDC-119.

Thermocouple Pyrometers

At a time when a great many people are asking questions about dependable pyrometers for war-industry use, Leeds & Northrup have just reissued—in strictly up-to-date form—their catalog on Micromax Thermocouple Pyrometers.

In 56 well-illustrated pages, this book tries to cut correspondence and to give war-time pyrometer users first hand the information they want about available instruments—indicators, recorders and controllers—and about the thermocouples and accessories which are used with them.

If, as a result of war-time conversion, you're a new or prospective user of balance-type (potentiometer) pyrometers, you'll be particularly interested in the concise but comprehensive description this book contains of how the basically-sound balance method is applied to the measurement and control of thermocouple temperatures.

In case you happen to have a copy of last year's edition, it should be pointed out that the present book differs from the 1941 edition only in minor detail.

But, as compared with the 1939 and previous editions—many copies of which are still in use—the present book is extensively revised. An automatically-balanced Micromax Indicator and the Model C Controller (non-indicating) for flush mounting have been added. The section on thermocouples has been expanded. Automatic control is outlined more fully than in previous editions.

To get a copy, ask Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia, Pa., for Catalog N-33A, Micromax Thermocouple Pyrometers.

V-Belt Drives

Simplifying the problem of selecting correct V-belt Drives for wartime applications is the primary purpose of a new Texrope V-belt Drive bulletin, issued by the Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Based on the theory that efficient V-belt power transmission applications necessarily begin with the choice of proper equipment, the new book reduces a wealth of engineering information to simplified charts and tables for quick selection of these vitally important power transmission units. From known factor and special service factor tables, correct V-belt and sheave sizes can be determined, the desired nominal horsepower ratings, and

WHEN HEAVY LOADS CAUSE
Machine Tool Chatter or
Hot Bearings and Gears

USE "STURACO" ★★★★
EXTREME PRESSURE ("EP")
MACHINERY OILS & GREASES

• Here is the answer to many of your lubrication problems caused by today's production demand of heavy loads, high speeds, and continuous operation of machinery and machine tools. "Sturaco" EP Oils and Greases, without any change in your accustomed viscosity or consistency, offer a minimum of 300% increased load carrying capacity with notable low torque.

Lubrication of ways—spindle bearings—gear heads—elevating screws—speed reducers—are typical examples where "Sturaco" application has solved tough lubrication problems. If you need help, write or phone today.

• • •

SEND FOR the new "Sturaco" booklet outlining laboratory research behind this genuine development, describing typical applications and listing various grades.

For All Cutting Fluid Problems
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finally the Texrope Drive catalog number are arrived at. This catalog number is then the key to the number of belts, belt section, belt length, the motor sheave and driven shaft sheave diameters.

List prices, stock sizes, dimensions and construction details are included for all Texrope Drives. Additional descriptions cover the application of Texrope Vari-Pitch Sheaves and Drives and the Vari-Pitch Speed-Changer.

Requests for the new wartime catalog, Bulletin B6051-C, are now being filled.

Elephant Size Dates on New Type Calendar

With dates as big as a house the new Post 1943 Calendar features a weekly pad you can see a mile.

This new calendar with its 52 weekly sheets is being offered free to those who request it on their business letterhead.

Built on a War Week basis the big black numerals can be easily read from any part of the drafting room. The over-all size is $15^3/_4 \times 24^1/_2$.

And this isn't all. A section of technical data for the engineer and draftsman is included, containing charts on wire and sheet metal gages, screw threads, etc.

Besides its functional value its extreme attractiveness would do justice to the wall of any drafting room. The top illustration printed in six colors portrays the draftsmans importance in today's production.

As long as the supply lasts they are yours for the asking. Address your requests to the Frederick Post Co., Box 803, Chicago.

How to Get the Most Out of Your Lathes

Anybody concerned with lathe operation will find much helpful information in the new series of bulletins that the South Bend Lathe Works is issuing in the interest of more efficient war production.

"Keep Your Lathe Clean" is the subject of the first bulletin, and is based on the theme of the series, "How to Get the Most Out of Your Lathes." This 16-page bulletin shows how keeping lathes clean will help increase production, reduce scrap, and lengthen the life of the lathe. Its 19 illustrations supplement the clearly written text matter to fully describe the best methods of cleaning the various lathe units. The importance of periodical cleaning of all machine tools is explained by the damage that can be caused by accumulated dirt and chips.

Copies of Bulletin H-1, "Keep Your Lathe Clean," can be obtained free of charge from the South Bend Lathe Works, Dept. 6M, South Bend, Indiana.

Welded Hot Water Supply Heaters

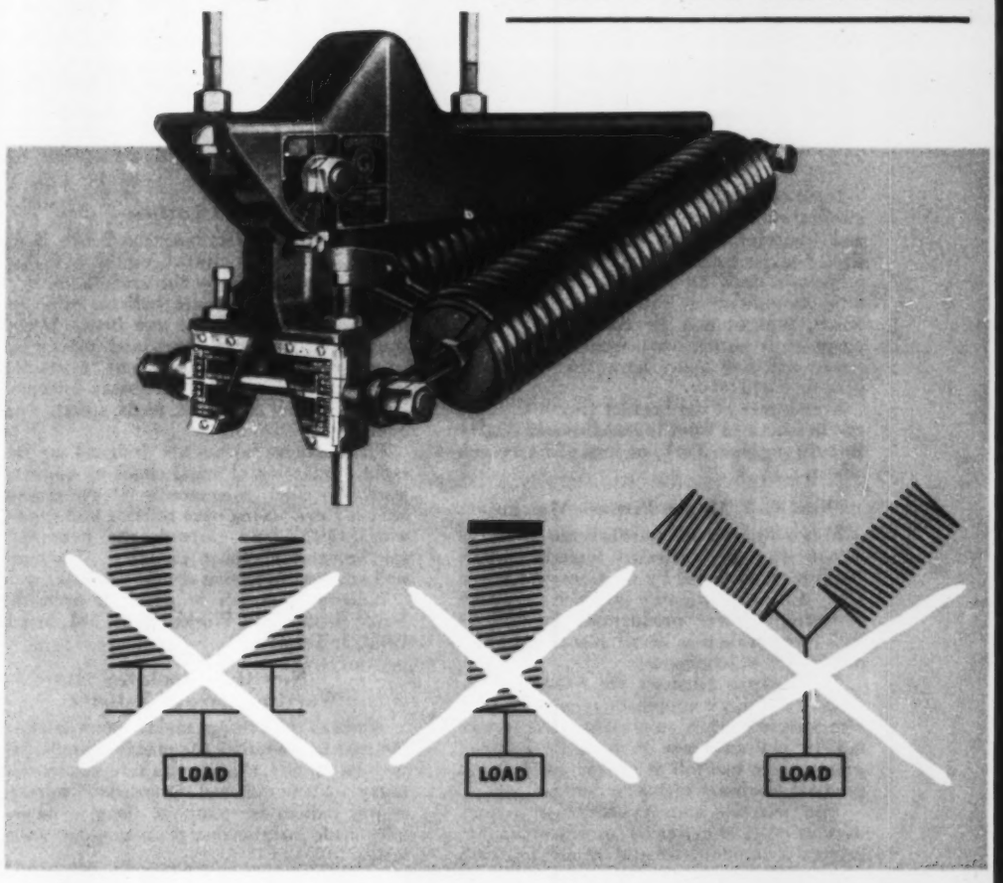
Kewanee Boiler Corp., Kewanee, Ill., announces their new Catalog TW-95b which contains descriptive data on Kewanee All-Weld Tobasco Water Heaters with diagrams and cuts. Full specifications given with dimensions tabulated in detail.

The name Tabasco first used by Kewanee on this type of Hot Water Heater nearly half a century ago has come to signify a tough steel product that can stand the gaff of delivering plenty of water good and hot with absolute dependability, using any fuel fired with just ordinary skill. This All-Weld model successor to riveted types has the improved base and rocking grate.

Built in 10 sizes, Tabascos may connect directly to the water mains of any city in the United States, and will safely withstand water working pressures up to 100 pounds per

Continued on Page 34

An Important DIFFERENCE



. . . now safeguards high-temperature PIPING SYSTEMS!

Regardless of the time spent on the design of ordinary-type spring hangers, their supporting effort always varies with deflection. For, the inherent nature of simple springs means that their load deflection rate, no matter how slight, brings about a reduction in the carefully calculated safety factor of the piping system.

But, all spring hangers are not alike! The important difference is in the unique GENSPRING Constant-Support Hanger which employs an automatic compensating lever. In its exclusive patented design, lever-rotation is such that the product of moment-arm and spring-forces is *constant* throughout the entire range of vertical movement. Thus, full safety factor of the supported system is always maintained!

Get complete information on GENSPRING Hangers for loads from 250 to 8500 pounds. Grinnell Company, Inc., Executive Offices, Providence, Rhode Island. Branch offices in principal cities of U. S. and Canada.

WRITE FOR complete Data Book on GENSPRING Hangers containing piping-travel calculations.

***GENSPRING* CONSTANT-SUPPORT HANGERS BY**

GRINNELL

WHENEVER PIPING IS INVOLVED

square inch, having been subjected to a hydrostatic test of 200 pounds per square inch before leaving the Kewanee factory.

On back page 4 is diagram of typical piping connections to Kewanee Storage Tank from the All-Weld Tabasco Water Heater.

Equipment for Quarries and Contractors

Ingersoll-Rand announces a new 42-page publication entitled "Equipment for Quarries and Contractors." It is a handy, pocket-sized booklet containing 72 illustrations and numerous data on rock drills, detachable bits, reconditioning equipment, hose lines, hoists, pumps, and air compressors. The language is entirely non-technical, and the reader will find many hints that may help save time and labor.

Free copies of the booklet (Form 2724-C) can be obtained from Ingersoll-Rand Co., 11 Broadway, New York, or any of its branch offices.

New G-E Motor Fitness Manual

Motor fitness requirements is the subject of a new 40-page illustrated bulletin (GED-1017) recently issued by the General Electric Co. Although primarily intended for plants converted to war production, the bulletin will prove valuable in all plants in which motors are widely used.

The bulletin discusses the following subjects in a highly comprehensive and informative manner: How to get the most service out of old and new motors, "switching" motors from one job to another, and equipping old machines with new motors.

Also, selection and application of motors, various types of motor enclosures, secondary ratings of standard integral-hp motors, ways to determine WR^2, motor maintenance, full load currents of motors, selection of a-c control, and the use of the hook-on voltammeter. A supplement explains how to save critical motor materials, including WPB recommendations, and information on the use of load-time-temperature charts.

The bulletin is arranged throughout for quick reference.

Turret Lathes

Bulletin 1004 describing the South Bend Turret Lathes, Nos. 1003-C and 1004-C, has been recently issued by the manufacturer.

This four-page file size bulletin fully describes and illustrates the new Bench Model South Bend Turret Lathes and their construction features. Convenient tabulated specifications list all the necessary information concerning capacities, feeds, speeds, and dimensions.

These Turret Lathes are designed for the rapid production of small chucking and bar work to close tolerances. Both models have a $10^1/_8$" swing over the bed and saddle wings, $1^3/_8$" hole through the headstock spindle, and 1" collet capacity. They are well adapted to second operation work.

Bulletin 1004 can be obtained from the South Bend Lathe Works, Dept. 6M, South Bend, Indiana.

New Handbook for Wartime Care of V-Belts

Whereas the average maintenance book of the past has assumed the reader's familiarity with its subject, this is not a safe assumption today. Thousands and thousands of workers in war industries—many of them women—have made maintenance training a new problem.

To help solve it, Allis-Chalmers has just published a new handbook—"Plain Facts on Wartime Care of Rubber V-belts"—which aims to make complete sense of the entire V-belt maintenance story.

It begins with the anatomy of a V-belt and principle of the V-belt drive—and ends with post-mortems on actual damaged V-belts. How the anatomy of a V-belt affects its maintenance, how to obtain proper V-belt tension, what to do about worn sheaves, what determines the life-expectancy of V-belts—these are some of the plain facts revealed in the new handbook.

This new book applies to all makes of V-belts, contains no advertising and is available without charge on request to Allis-Chalmers.

COMING MEETINGS AND EXPOSITIONS

For the next three months

NOVEMBER

9–10	Engineers Society of Western Pennsylvania Third Annual Water Conference, Wm. Penn Hotel, Pittsburgh, Pa.
9–13	American Petroleum Institute, 23rd Annual Meeting, Palmer House, Chicago, Ill.
11–14	Society of Naval Architects and Marine Engineers, 50th Annual Meeting, Waldorf-Astoria, New York, N. Y.
16–17	American Institute of Chemical Engineers, 35th Annual Meeting, Netherland Plaza, Cincinnati, Ohio
24–29	American Chemical Society, Chicago Section, National Chemical Exposition, Hotel Sherman, Chicago, Ill.
30—Dec. 4	The American Society of Mechanical Engineers, 63rd Annual Meeting, Hotel Astor, New York, N. Y.
30—Dec. 2	American Society of Refrigerating Engineers, Annual Meeting, Hotel Commodore, New York
30—Dec. 4	Society for the Advancement of Management, Annual Conference, New York
30—Dec. 4	15th National Power Show, Exposition of Power and Mechanical Engineering, Madison Square Garden, New York, N. Y.

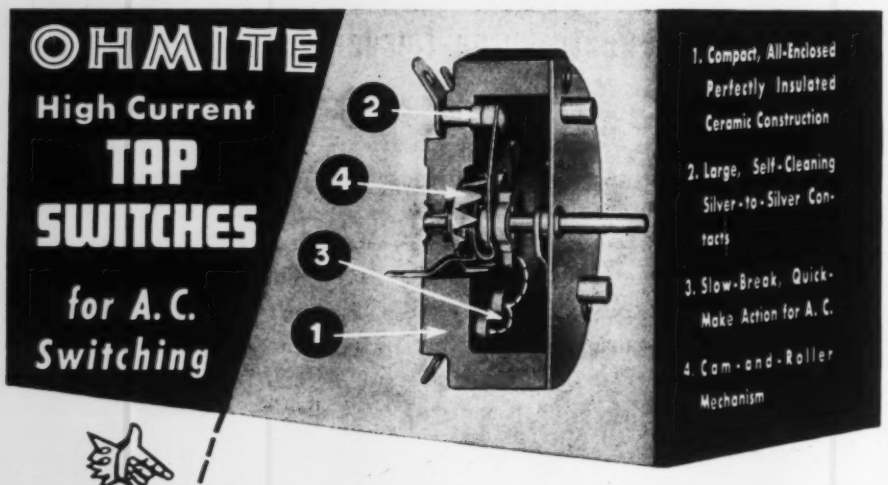
DECEMBER

28—Jan. 2	American Association for the Advancement of Science, Annual Winter Meeting, Hotel Commodore, Pennsylvania, etc., New York
7–9	American Society of Agricultural Engineers, Fall Meeting, La Salle Hotel, Chicago, Ill.

JANUARY, 1943

11–15	Society of Automotive Engineers, War Production-Engineering Meeting and Engineering Display, Book-Cadillac Hotel, Detroit, Mich.
20–21	American Society of Civil Engineers, Annual Meeting, Engineering Societies Building, New York, N. Y.
25–27	American Society of Heating and Ventilating Engineers, Annual Meeting, Hotel Gibson, Cincinnati, O.
25–29	American Institute of Electrical Engineers, National Technical Meeting, Engineering Societies Building, New York, N. Y.

For Calendar of coming A.S.M.E. Meetings see page 817 in the editorial section.



High Current Switching — *SIMPLIFIED*

The cut-away view shows some of the important design features of Ohmite non-shorting, load-break, single-pole, multipoint rotary selectors. These features, and many others, greatly simplify high current circuit switching and provide greater operating convenience—in battery chargers, tapped transformers, welders, radio transmitters, and other applications. There are five compact models, rated at 10, 15, 25, 50 and 100 amperes, A.C.—with any number of taps up to 11, 12, 12, 12 and 8 respectively. Also available in tandem assemblies.

Send for Tap Switch Bulletin. Also write on company letterhead for complete Catalog No. 40 on Rheostats, Resistors and Tap Switches.

OHMITE MANUFACTURING CO.
4808 Flournoy Street ★ Chicago, U. S. A.

"We O. K. Your Recommendations

and—we do not have any shutdowns"

★

"As your records show, we have installed Clevelands frequently since 1923," writes the Engineering Executive of a long-established Eastern Corporation.

"We first tested three makes of gear reducers, but found Clevelands most capable of carrying our heavy 24-hour loads. In general, we accept your engineering recommendations and—*we do not have any shutdowns.*"

Cleveland Engineering recommendations are sound and trustworthy—you and your customers can accept them with confidence.

And, even after many years' continuous operation, Cleveland owners report "no maintenance cost worth recording."

Clevelands keep your machines going in customers' plants! The Cleveland Worm & Gear Company, 3264 East 80th Street, Cleveland, Ohio.

Affiliate: The Farval Corporation, Cleveland, Manufacturers of Centralized Systems of Lubrication

In Canada: PEACOCK BROTHERS LIMITED

CLEVELAND WORM GEAR

Speed Reducers

The Standards COLUMN

News of Interest to Manufacturers

Markings for Grinding Wheels

The Proposed American Standard for the Markings for Grinding Wheels is now before the American Standards Association for final approval and designation as an American Standard.

This standard was developed to simplify a complicated condition in industry caused by the diversity of grinding wheel markings used by the various manufacturers of grinding wheels. The need was recognized for a standard system of wheel markings that would cover all the various types and grades of grinding wheels now in use. Wheels thus marked will simplify ordering and stocking wherever a quantity is kept on hand, and it will also enable the user to help the grinding wheel manufacturer in the selection of a wheel best suited for a particular job. This standard is more simple, more uniform, and more consistent than all other systems heretofore used in the past for the marking of grinding wheels.

Each marking will consist of six parts, placed in the following sequence: (1) Abrasive, (2) Grain Size, (3) Hardness or Grade, (4) Structure, (5) Bond or Process, and (6) Manufacturer's Record.

In recognition of a growing demand for uniform grinding wheel markings, the Sectional Committee on Standardization of Small Tools and Machine Tool Elements, B5, at its December, 1940 meeting, authorized an inquiry preliminary to the initiation of a standards program. At the December, 1941 meeting the chairman, W. C. Mueller, of Sectional Committee B5 reported that he had communicated with the Grinding Wheel Manufacturers Association, that the association favored standardization, and that early in 1940 the association's standing committee on standardization in collaboration with a special standards committee of General Motors Corporation had undertaken the formulation of a tentative standard marking system based on a unification of several existing marking systems. He reported also that this system was completed in September, 1940, and put into effect January 1, 1941, for a trial period of one year.

In consideration of representations from the Grinding Wheel Manufacturers Association and the General Motors Corporation to the effect that the tentative standard had worked out satisfactorily during the one year's trial, the members present at the December, 1941 meeting of Sectional Committee B5 recommended its acceptance as a proposed American Standard.

Copies of the proposal were made available to the members of Sectional Committee B5 early in 1942 and in May it was presented to them for vote by letter ballot (1) on the acceptance of this proposal as the equivalent of a report of one of its technical committees, (2) on the approval of the text with the recommendation that it be submitted to the sponsors of B5 for approval, and (3) on the transmission to the American Standards Association for adoption as an American Standard.

For further information—Address

The American Society of Mechanical Engineers
29 West 39th St., New York, N. Y.

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have everything ★

★Why settle for less?

WHAT do you seek in that welded piping job? Speed? Economy? Sound engineering to meet extreme conditions? What?

Of course any one of these considerations may slightly out-rank any other, depending on the nature of the installation. But the fact remains that every one of them is mighty important to *every* job.

That's why it pays to use the welding fittings that are designed down to the last detail to meet all requirements of every job. With features that are combined in no other welding fittings, WeldELLS give you the means of doing any job as *well* as it can be done—as *easily* as it can be done—and therefore as *economically* as it can be done.

A number of these features are pointed out above. Some provide engineering advantages; others reduce installation time and cut costs. Combined, they give you the extra value that distinguishes WeldELLS. Why accept less than the Welding Fittings that have *"everything"*?

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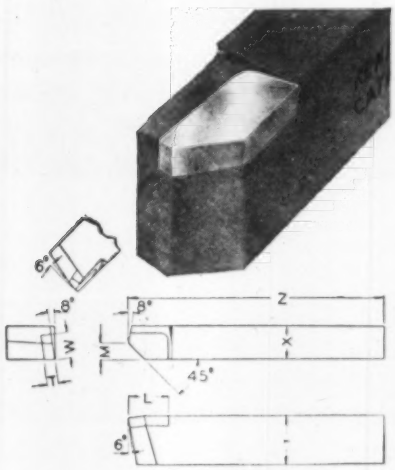
- *NEW EQUIPMENT*
- *BUSINESS CHANGES*
- *LATEST CATALOGS*

Available literature may be secured by addressing a request to the Advertising Department of MECHANICAL ENGINEERING or by writing direct to the manufacturer and mentioning MECHANICAL ENGINEERING as a source.

• NEW EQUIPMENT

New Kennametal Tools

The McKenna Metals Co., 367 Lloyd Avenue, Latrobe, Pa., in answer to the demand for a steel-cutting-carbide tool having a lead angle is announcing new Styles 39 and 40 Kennametal tools. Styles 39 and 40 tools combine the lead angle or side cutting edge angle with a tip for longer than customary on carbide tools having a lead angle. Styles 39 (as pictured) and the opposite hand Style 40 (not pictured), will be considered as standard tools in the Kennametal line.

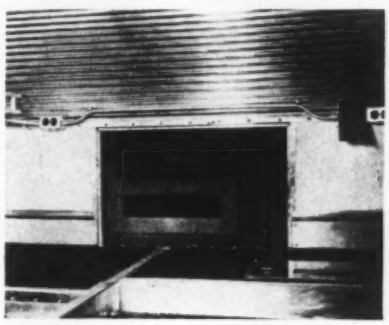


These tools are particularly economical in shell turning operations because only the edge on the lead angle is sharpened and it is easy to maintain the control position of the nose as the tool is reground.

These tools are being widely used in shell turning where uniform forgings permit the depth of cut never to exceed the length of the tip having a lead angle. The chip breaker is ground only on the section parallel to this lead angle. These tools which are available in sizes of $1/8 \times 5/16 \times 5/8''$ to $3/8 \times 3/4 \times 1\,1/2''$ may also be used for chamfering operations.

The manufacturer will furnish complete information on request.

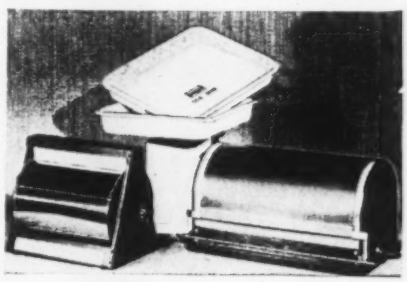
Air Conditioning Goes to War



Designed originally to keep you cool and comfortable, air conditioning units produced by Carrier Corporation, Syracuse, New York, are pictured here in a new wartime job. They are used in U. S. Army photographic trailers for the purpose of reducing the moisture content of the air and maintaining temperatures that will permit efficient operation and production of photographic aerial films and prints. One of these air conditioning units is installed in each of the two rooms of the trailer. Without this equipment it would be well nigh impossible to accomplish successful processing of photographic material in localities where temperatures exceed 90 degrees F. Successful use of this equipment has been made under desert operating conditions where temperatures ran as high as 120 degrees F., according to the Army Air Forces.

Photocopy Machine

Today's demands for more and more office work to keep up with the requirements for reports, statistics and accounting procedures—and more and more detail work in factories to meet requirements for duplicates of orders, extra copies of blueprints and tracings, etc.—and the time and labor involved present a problem to the industrial field. To speed up production and save man-hours, the manufacturer has perfected a photocopy machine which produces copies similar to photostats, the actual size of the original, of anything written, typed, printed, drawn or photographed.



These machines are reported to produce perfect copies without a dark room and without skill or technical knowledge. And because they are photo-exact, no comparison or proofreading is required. There is no maintenance cost—the operating cost is limited to the size of copy being reproduced. Executive departments use it to copy important contracts, agreements, and confidential matters. The sales department makes copies of inquiries and other matters from customers. The engineering department uses it to make immediate copy directly from blueprints without making tracings. They also use it for copying specifications and a multitude of other matters so important in production problems today. The comptroller uses it to copy financial records and statistics. Many firms are using it to make copies of all vital papers which they store in Safe Deposit Vaults or other protected places as insurance against sabotage and air raids. One person can do the work of a dozen, and do it accurately and completely with the photocopy machine and, in addition, it releases important equipment (such as typewriters) for other uses.

Additional information on the photocopy machine may be obtained from American Photocopy Equipment Company, 2849 N. Clark Street, Chicago.

Roebling "Flatweave" Flexible Wire Rope Slings

"Flatweave" is a trade name of a new wire rope sling developed by the John A. Roebling's Sons Co. to meet a universal need for a light, flexible, non-kinking, non-spiralling sling to handle loads more easily. It was developed specifically for lifting light and medium loads where the legs choke the load or the sling comes in direct contact with the load being lifted.

"Flatweave" slings have a flat bearing surface which allows an even pressure on each of the six ropes which comprise the sling, thereby prolonging its useful life. Being flat and flexible, they are easily passed through or under the load.

The "Flatweave" body is made up of six separate ropes. Two pairs of two ropes each are laid in opposite directions. These are united into a finished sling unit by two single tie ropes which alternately pass back and forth around one pair and then the other in a spiral figure 8. This method of construction eliminates the possibility of any scissors or shearing action between the various ropes.

The "Flatweave" pattern develops a high strength efficiency which is equalled by the high efficiency of the specially constructed loops. The same safe loads can therefore be allowed with loops as with socketed ends. The loops, which can be used as chokers without the use of thimbles, are generously proportioned and easily slip over crane hooks or lifting lugs.

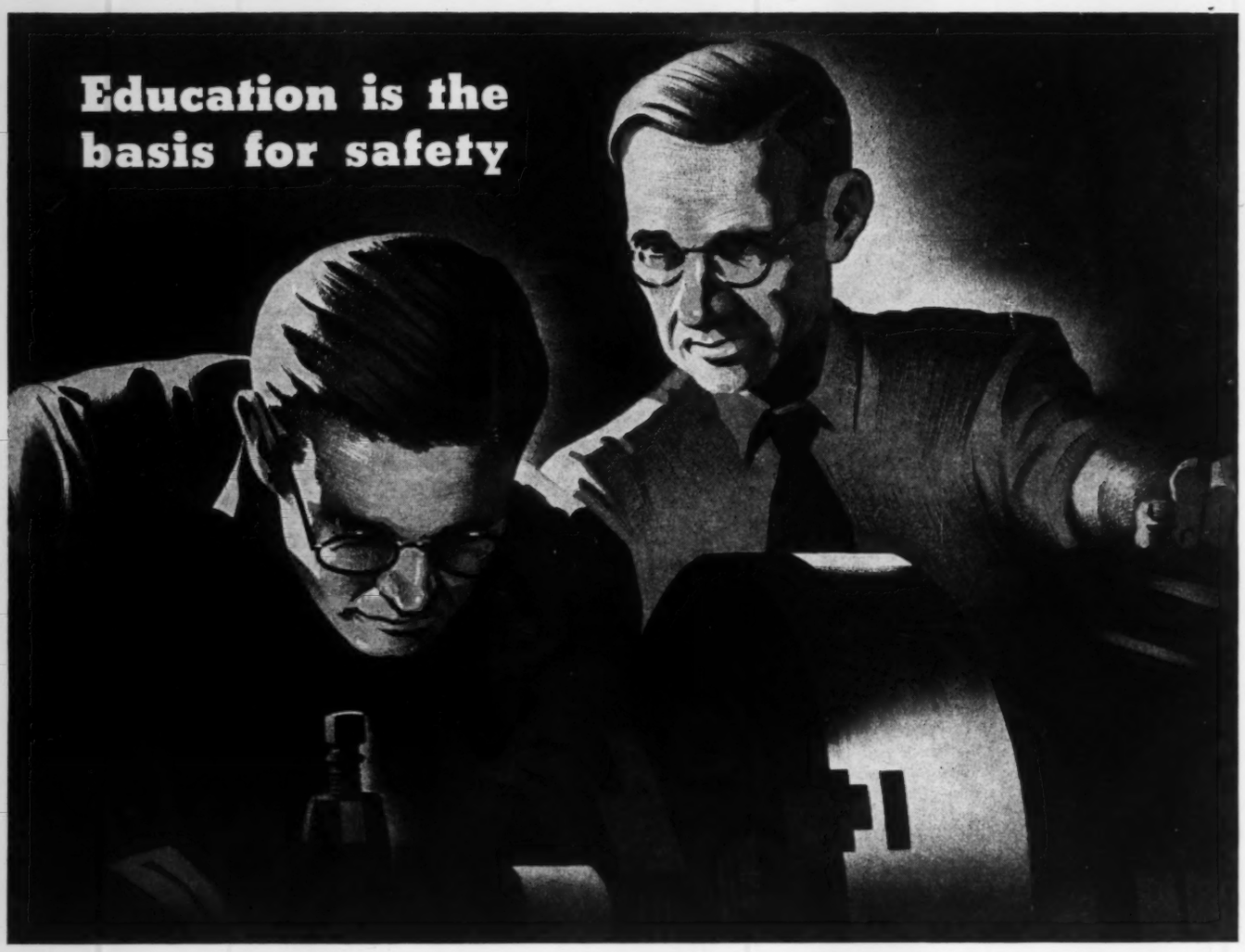
The compact steel sleeves are compressed over all rope ends, thus permanently securing them. There are no splices, tucks or servings to become dislodged or loosened over sharp corners or in pulling underneath loads.

Send for descriptive literature, Bulletin A-881.

New Asbestos-Faced Board Alternates for Steel

Since WPB orders have drastically restricted the use of steel for many purposes, a new board of laminated construction, the product of a prominent research laboratory and said to be a valuable alternate for sheet metal, is receiving wide attention.

Continued on Page 23



Information supplied by the National Safety Council

Labor, particularly inexperienced labor, cannot be expected to recognize the full penalties of carelessness in the shop. Management has assumed the responsibility of supervising safety measures, and has cooperated in establishing sound safety rules.

Nevertheless, the large increase in labor personnel due to war needs, plus the influx of inexperienced men, have resulted in a substantial increase in lost time accidents.

Even assuming that the obvious safety measures with regard to operating machinery, electrical equipment and shop traffic have been installed, two factors — education and eternal vigilance — determine the real effectiveness of any safety program.

Both are the responsibility of the supervisory staff, from foremen up. The foreman who does a thorough job of educating his particular group in safety rules and cooperative enforcement has done much to cut down accidents. Management that takes an active interest in both safety education and the enforcement of safety measures has taken a great step forward in reducing wastage of irreplaceable production time.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.
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MOLY

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Tests are reported to have demonstrated that the product is rustproof, moisture-resistant and strong; that it meets fire tests of Federal Spec. 55-A-118 (Fire Retardant); has important advantages for many industrial applications such as air ducts (return or supply), joist liner, partition construction, shop and factory ceilings, clothes chutes, dumb-waiter lining, elevator shaft protection, spray booths, attics and stairwells, reflector panels for indirect lighting.

Other merits attributed to the product are: it is flame-proofed; a non-conductor of electricity; clean finish; odorless; free from asphalt or organic binder; tough; light; easily worked.

Since the board is finished in white asbestos felt on both sides, it is said to be attractive in appearance and to save, in many instances, the cost of an additional finish. However, it is claimed that the board readily takes the usual casein or cold water paint and, after sizing, lead and oil.

The board is available, according to the manufacturer, in sheets 33 inches wide and 60 inches long, especially suitable for standard joist spacing of 16 inches.

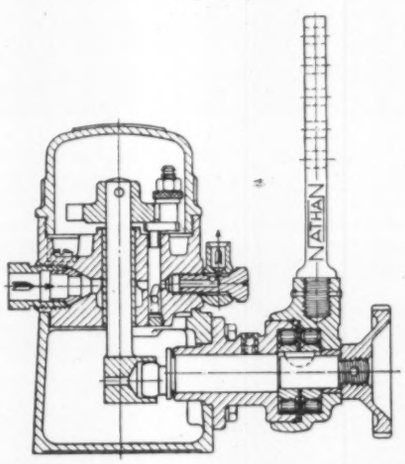
This material known as A-D Board, is a product of The Philip Carey Manufacturing Co., Lockland, Cincinnati, Ohio. Further information and samples of the board may be had by writing direct to the manufacturer.

Timken Sets New Speed Record in Freight Car Handling

The Timken Roller Bearing Company's freight car time conservation program, in effect during the last eleven months, has released for other use the equivalent of 157 one-hundred-car freight trains for 24 hours.

Since November, 1941, The Timken Roller Bearing Co. has completely eliminated demurrage of all freight cars bringing material into or taking material out of their ten plants. Twenty thousand, three hundred and ninety-five cars were held for an average of 29 hours and 29 minutes. This is 18 hours and 31 minutes less per car than the free time that is allowed by the railroads.

Nathan Mechanical Lubricator Type P



This lubricator comprises a pumping unit mounted on a base with a connection at its side for oil from a source of supply remote from the lubricator. A horizontal shaft in its base is operated by a roller ratchet which has its drive arm connected to a reciprocating part of the engine, or to an eccentric mounted upon a rotating part. An eccentric pin at the inner end of the horizontal shaft engages a socket in a vertical shaft at the upper end of which a slotted disc is located. Offset pistons engage the slotted disc, and, by virtue of the eccentric pin co-operating with the socket of the vertical shaft, are given a reciprocating and simultaneously oscillating motion, opening and closing suction and discharge ports, thus entirely eliminating valves. The travel of each piston can be varied, making the rate of oil discharge from each individual feed adjustable. Instead of with ratchet drives the lubricators can also be furnished with rotary drives.

Independent sight feeds, filled with glycerin, can be placed in the discharge lines at convenient points, preferably grouped together, to observe in drops the amount of oil fed through each of the lubricator feeds.

For further details write to Nathan Manufacturing Co., 250 Park Ave., New York, N. Y.

High Production Record at Elastic Stop Nut Corp.

Union, N. J.—William T. Hedlund, president of the Elastic Stop Nut Corp., in a letter to employees of the company's main plant here, praised them for the now high production record established during the week of Oct. 5th. The entire facilities of the company are functioning for the war effort.

Mr. Hedlund's letter reads: "My sincere thanks and congratulations to all of you for the grand job you did last week . . . . in exceeding every previous weekly production record.

"You have a right to be justly proud of your record on the production front of this war. You not only set an all-time production high, but, while doing so, maintained quality of product which is ever important.

Continued on Page 24

APëCO PHOTO COPIES Save MAN HOURS!

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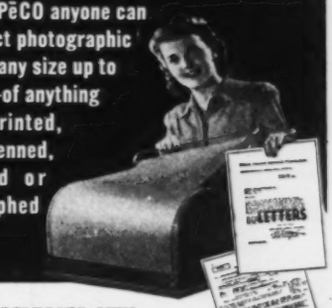

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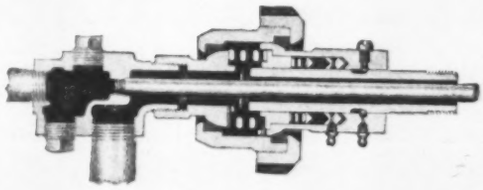

Type 7RB-8CRB with Adapter 18RB

Two Ball Seats *provide* Flexibility, Eliminating Strain on the Revolving Sleeve

Heat or Cool Rotating Rolls at Lowest Maintenance Costs

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"We all know that the great need of the country today is more production . . . . more production, particularly of aircraft parts such as you are making. Your splendid performance will be the incentive to the even greater achievement which is so necessary for the boys on the military front and our country's ultimate victory.

"Thanks again for a splendid job well done."

Carrier Humidifiers at Omar Flour Mills

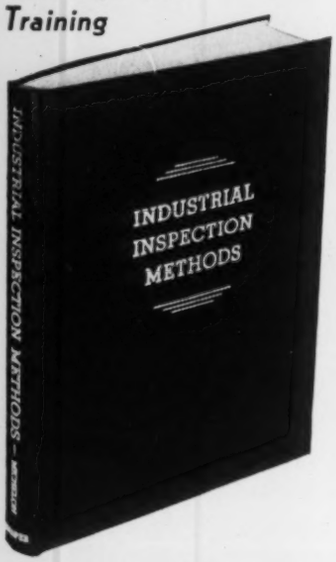
The problem of controlling the moisture in fine baking flours has been solved at the Omar Four Mills, Adams City, Colorado, by an installation of a plant humidifying system through which the moisture content of the air is closely controlled. The humidifying equipment was manufactured by Carrier Corp., Syracuse, New York, world's largest producer of air conditioning equipment.

The huge Omar Mills grind Kansas and midwestern wheats shipped to Colorado and produce top quality flours exclusively.

Prior to the installation of the Carrier system it was difficult to keep the moisture content of the flour within the minimum specified by government pure foods authorities for best baking. By-product of the humidifying installation was to increase plant safety by reducing dry dust of freshly milled flour which, if allowed to accumulate in too great quantities, creates danger of explosive combustion.

The Carrier central plant humidifier is a system branching from a first floor machine room installation with ductwork to all floors of the building. Manual controls are used to limit or increase the air brought into the plant, while moisture on each floor is controlled through the use of individual hygrostats. Since the system was installed there have been few over-moist or under-moist batches of flour, and plant atmosphere is kept well below the point where explosive combustion might result.

For War Inspection Training



INDUSTRIAL INSPECTION METHODS

By LENO C. MICHELON

Formerly Instructor in Ordnance Inspection, War Training Division, Illinois Institute of Technology

Based on the experience gained in training hundreds of men and women in industrial inspection methods for the war program • • • • Provides a complete and detailed presentation of the inspection methods and devices now used by both industry and the Army Ordnance Inspection Service • • • • Prepared in close cooperation with the Inspection Division of the Chicago Ordnance District • • • • More than 300 photographs and drawings showing actual inspection set-ups.

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Please fill my order for Michelon's "Industrial Inspection Methods," at $3.50.

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South Bend Lathe Receives Third Production Award

In recognition of their production achievements, the joint Army-Navy Production Award with Star has been presented to the South Bend Lathe Works. Representatives of labor and management are shown together with the award, which is the third they have received this year. The previous awards were the Navy "E"—Ordnance Award and the All-Navy "E".

Admiral Wiley Chats With L&N Girl Worker

Admiral Henry A. Wiley, with Factory Manager W. R. Coley of Leeds & Northrup Co., Philadelphia, Pa., pauses for a word with an L&N girl worker at time of recent presentation to the firm of the Army-Navy "E". Censorship has "blacked-out" the background.

In presenting the "E" Burgee, Admiral Wiley said that the recommendations to the Navy, on which the award was based, "could not have been higher," and urged further increase in production.

Wm. L. Batt, Vice-Chairman, WPB, expressed the Board's pleasure at seeing the wartime achievements of industry so fully recognized by our armed forces.

President C. S. Redding of L&N, joined by spokesmen for L&N employee groups, pledged continued increases in the Company's out-put of the classified war material which has been superimposed on a greatly augmented production of its established lines of instruments, telemeters, controllers and heat-treating furnaces.

General Electric Salvages 100 Train Loads of Waste

Schenectady, N. Y.—By salvaging everything from outdated rubber stamps to an obsolete power plant, the General Electric Co. will recover and return this year to war production 380 million pounds of waste material, eough to fill every car in 100 average freight trains, according to H. J. Beattie, head of the Company's salvage departments.

"At the present rate of accumulation our salvage departments this year will handle 5000 carloads of scrap," Mr. Beattie said.

To prevent excessive waste, however, designing engineers, draftsmen and methods men at each of the Company's plants constantly are developing new ways of reducing the amount of material necessary in manufacturing. Paralleling these efforts is the suggestion system, by which war workers suggest methods of increasing production, especially by conservation of vital materials. The Company has paid out approximately $100,000 for more than 10,000 suggestions adopted so far this year. "All-Out War Production" committees formed at each of the plants are intensifying conservation efforts still further.

Manufacturing experts examine various types of electric apparatus, seeking the answers to such questions as these: Is this piece necessary? How could it be produced more quickly? If it is being made of a critical material, what substitute could we use?

Virtually all waste materials, however, have important applications in war production. Approximately 80 per cent of the total tonnage collected by the salvage department is steel scrap. Steel mills require equal amounts of such steel scrap and new pig iron in manufacturing the steel which goes into planes, tanks, ships and guns. Such other important metals as aluminum, tin, lead, copper, zinc, solder, brass and babbitt comprise 12 per cent of the Company's scrap

• Keep Informed

total by weight but account for 56 per cent of the salvage value. Even waste paper, obtained chiefly from used cartons, is an important item, for it is shipped to mills manufacturing boxes for cartridges. Approximately 30 carloads of paper will be salvaged this year.

General Electric's scrap yield will be swelled this year as a result of the Company's "treasure hunt" for war-scarce materials in conjunction with the nation's "Salvage for Victory" campaign. At one plant alone 2500 obsolete rubber stamps were turned in. At another an old power plant, no longer useful, yielded 27 carloads of scrap when it was dismantled. A third plant scrapped several carloads of obsolete dies and tools, some of which had been used 50 years ago by Frank Sprague, famed inventor and one of the pioneers of the Company.

This "treasure hunt" alone produced 200 cardloads of scrap. Inspired by such slogans as "clean house to clean Hitler," employees made thorough searches of offices, tool rooms, laboratories, lockers and work stations for "dormant" scrap. Old fixtures, wiring, piping, conduits, crane equipment, and other machinery soon began to pour in for handling by the salvage department.

All of the scrap is transferred to the salvage departments where it is classified and sorted into 125 different classes, each of which is kept carefully segregated. Scrap is of the greatest possible use in war industry when it is kept clean and properly sorted.

To save time, an all-important war production factor, operation methods have been stepped up so that most materials are classified, processed, and readied for shipment within 24 hours of collection.

The salvage departments at the various plants are equipped with hydraulic baling presses, magnetic separators, chip crushers, torch cutting equipment, alligator shears, and all types of handling equipment such as cranes, industrial trucks, and conveyors. These facilities reduce scrap to convenient shipping shapes and facilitate handling in processing.

Several of the salvage departments have furnaces for refining lead, tin, babbitt and solders, distilleries and filters for reclaiming solvents and oils, laundry equipment to wash wiping cloths and canvas gloves, and wood-working equipment for salvaging lumber. At one plant the ashes from the incinerator plant are processed through a ball mill and then passed over water-fed vibrating tables, thus recovering tons of copper and steel and smaller amounts of tin, lead and silver annually.

Double "Bull's-Eye" Scored at Two B. G. R. Spring Plants

The twin plants of Barnes-Gibson-Raymond Div. of Associated Spring Corp. at Detroit and Ann Arbor aimed their sights at the Axis enemies and won the highest award of the Treasury Department, the Bull's-eye Flag. Acting independently of each other,

Continued on Page 26

...NOW STEPPING UP WAR DELIVERIES

1. **They save the worker's time**
Each nut is a self-contained easy-to-handle unit that goes on fast . . . and its self-locking action is immediate and automatic.

2. **They eliminate the dangers of careless assembly**
The locking element is built into the nut . . . no pins, wires, washers, or shims that can be forgotten or incorrectly applied.

3. **They reduce inspection needs**
With less operations and less parts to be checked . . . there's another important saving in man-hours.

There are more Elastic Stop Nuts on America's airplanes, tanks, guns, Naval vessels, and production equipment, than all other lock nuts combined.

» Write for folder explaining fully the Elastic Stop principle

ELASTIC STOP NUT CORPORATION
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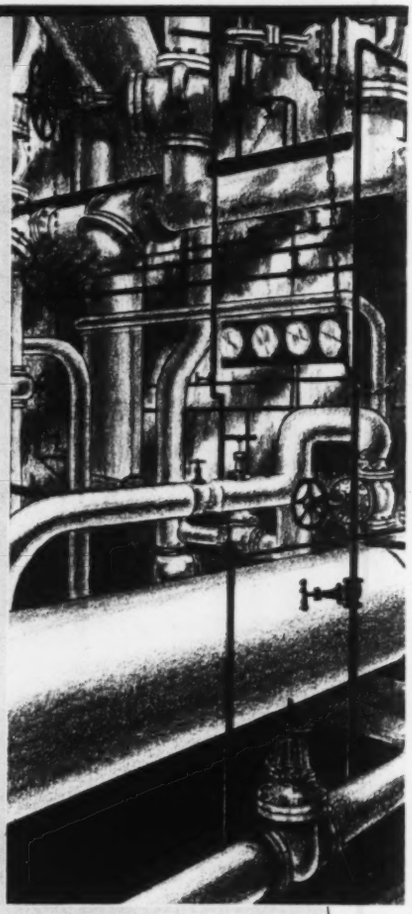
These are Times to DOUBLE-CHECK Your Valves



Proper care of valves begins with their purchase—meaning, that it pays in the end to buy good valves first.

But proper care doesn't end there . . . even the best valves need looking after, and prompt servicing, when necessary, will save more costly repairs and replacements later.

And these days, when it isn't easy to get new valves, and those you now have must do double and triple duty, it's just good business to do a little extra checking and inspecting of this vital equipment.

In the interest of uninterrupted production and the preserving of critical materials, Lunkenheimer urges every valve user to take extra special care of the valves he now has in service. They'll respond to good treatment and repay you in better service, less time out for repairs, and a minimum expenditure for maintenance.

Since virtually all materials used in the manufacture of valves are on the list of critical materials, valve users are urged to furnish the highest possible preference ratings and proper "end use" symbols on their orders. This will be of mutual helpfulness.

ESTABLISHED 1862
THE LUNKENHEIMER CO.
"QUALITY"
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NEW YORK CHICAGO
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LUNKENHEIMER VALVES

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these two springmaking units conducted War Savings Bond drives which netted the impressive total of over 90% of employees pledging 10% or more of each week's pay to the purchase of War Savings Bonds.

The Barnes-Gibson-Raymond Div. is heavily engaged in production of war materiel—being one of the largest producers of springs in the country. Previous to conversion to war production, they had been an important supplier of springs to the automotive companies. Mr. Lyman D. Adams of Detroit is general manager of the plants. William M. Barr was Master of Ceremonies at the presentation.

Carrier Corp. Receive Navy "E"

Carrier Corp., one of the first twenty-five companies to receive the Navy "E" for excellence in war production, has been awarded the Army-Navy "E" with two stars.

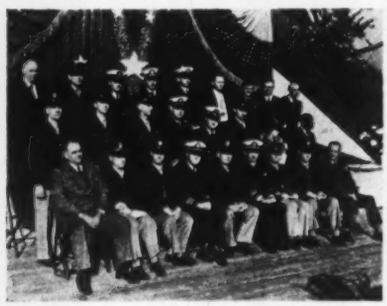
Presentation of the award to management and employees was made by Lieutenant Commander J. B. Staley, U.S.N. at the recent dinner of the Carrier Service Club, held annually in Syracuse, N. Y. Present at the ceremonies were 500 Carrier employees who had completed five years or more with the Corporation.

Dinners of the Carrier Service Club were also held recently in Chicago, on October 8, and in New York, on October 24.

Speakers at all three meetings included Dr. Willis H. Carrier, chairman; Cloud Wampler, president; and E. T. Murphy, senior vice president.

Combustion Engineering Awarded Army-Navy "E"

On Navy Day, October 27th, the Army-Navy "E" Award was presented to the Hedges-Walsh-Weidner Division of Combustion Engineering Co., Inc. The presentation was made in a colorful out-of-door ceremony at the plant in Chattanooga, Tenn., attended by some 3000 employees and their families.



Lt. Colonel J. C. Shouvlin of the Cincinnati Ordnance District made the presentation address, in the course of which he said, "Fortunately, this company happens to be one that started producing for war over three years ago. The production we have gotten out of your company has been worth its weight in gold. It is worth its weight in gold because the Government had the foresight to order, three years ago, what it wanted and the management of your company showed the proper disposition at all times to cooperate with the Government. Without full cooperation we could not have been in the state of readiness we are in today."

The acceptance address was delivered by A. J. Moses, Vice-President and General Manager of the Company's Chattanooga plant. In expressing the spirit in which the Award was accepted, Mr. Moses said, "There is only one issue for Americans today. It

is a very simple issue which all of us can understand. Are we prepared and determined to do our duty as Americans. If we are, we shall let no personal or group consideration deter us from doing our best to back up our fighting forces—not some of the time or most of the time but all of the time until complete and final victory is ours."

Presentation of the "E" pins to five selected employees was made by Lieutenant Commander J. H. Gibbons, U. S. N. R.

The largest of the Company's four manufacturing units, the Hedges-Walsh-Weidner Division is operating 24 hours a day, 7 days a week, supplying boilers and related equipment for practically all types of war production plants. Included in this category of work are boiler units and special pressure vessels for most of the larger powder plants. The Company is also supplying complete boiler units for naval and cargo ships, its contracts covering nearly 40 per cent of the entire shipbuilding program of the U S. Maritime Commission. It is a recent recipient of the Maritime Commission's "M" Award.

International Nickel Wins Third Navy Honor

Announcement of the third war production award to The International Nickel Co. plant at Huntington, West Va. is made by Robert C. Stanley, President, following receipt of official word from Admiral H. A. Wiley, Chairman of the Navy Board for production Awards.

The latest honor gives the plant the right to fly the Army-Navy "E" with two stars. Previously the works had received the Naval Ordnance award, later followed by renewal in the form of the All-Navy "E" award with one star. The plant is among the first twenty-five throughout the nation, and the first in the Fifth Naval District, to win the two-starred Army-Navy "E" pennant. Each star represents the renewal of production honors for a six months' period. The original award was for a twelve-month period.

"On behalf of the Under-Secretary of the Navy, I congratulate every man and woman of the Huntington, West Virginia Plant of The International Nickel Co., Inc. on their achievement," Admiral Wiley notified Mr. Stanley.

"This Production Award is not lightly bestowed in the first instance; the requirements for renewal are equally exacting. By being selected for the honor a third time you have demonstrated that yours is no half-hearted, flash-in-the-pan effort, but rather a solid determination to supply the Army and Navy with the materials they must have to carry the engagement to the enemy. That's the spirit that has made the nation what it is today. It is the spirit that will win this war."

Salvage Wardens Hunt Scrap at Westinghouse

Two hundred salvage wardens will soon patrol the workshops of the Westinghouse Electric & Manufacturing Co., hunting out scrap and promoting full use of war-vital materials. Modeled after the civilian defense units which have been set up in every American community, the salvage warden plan will operate continuously and will extend to other plants of the company after being tested at the East Pittsburgh works.

On each scrap hunter's left arm is a blue, red and yellow brassard, similar to the Office of Civilian Defense insignia worn by air raid wardens. The arm band bears the legend "Salvage Warden" and the V for Victory sign.

Four workmen in each section were appointed zone wardens, each man serving a full week every month. They are under the direction of district wardens who will meet weekly with the Chief Warden, H. H. Wheeler of the factory service division, thus establishing a chain of command from the top down to the last zone warden. At the weekly meetings, the district leaders will report the findings of their men, review results and plan future action.

First aim of the wardens is to reduce the amount of scrap. They are under orders to make every effort to find a use in production for every bit of material. If a steel plate, for example, is not suitable on the job for which it was ordered, the warden checks other departments to see if they can use it. The plate goes to the scrap pile only when it can serve no other wartime purpose.

Next they will hunt for dormant scrap—old machinery that cannot be repaired, useless materials stored in out-of-the-way corners, broken or obsolete tools in drawers and on benches.

Ten million pounds of scrap were collected in the last six months at the East Pittsburgh plant and the wardens expect to dig out several more million pounds before the year ends.

To prevent mixing of different kinds of metals, a sharp watch will be kept on scrap bins placed beside cutting machines. If copper chips are contaminated with steel shavings, the resulting metal cannot be used again where pure copper is required.

Every piece of steel, copper, aluminum and rubber, every idle machine and every operation will be checked by these men, and it is estimated that a 25 per cent increase in savings of materials will result.

Thirty tons of idle steel, copper and other metals will be taken from an abandoned service plant which is being dismantled in Pittsburgh. Five gondola cars that hadn't been used for years on the intra-plant railroad will soon be going into an open hearth furnace as first grade scrap. More than 8000 obsolete dies and jigs, made of high grade steel, were released from storage and added to the scrap pile.

Last year all Westinghouse plants turned over to scrap dealers 203 million pounds of scrap metals and other materials, with the East Pittsburgh works accounting for ap-

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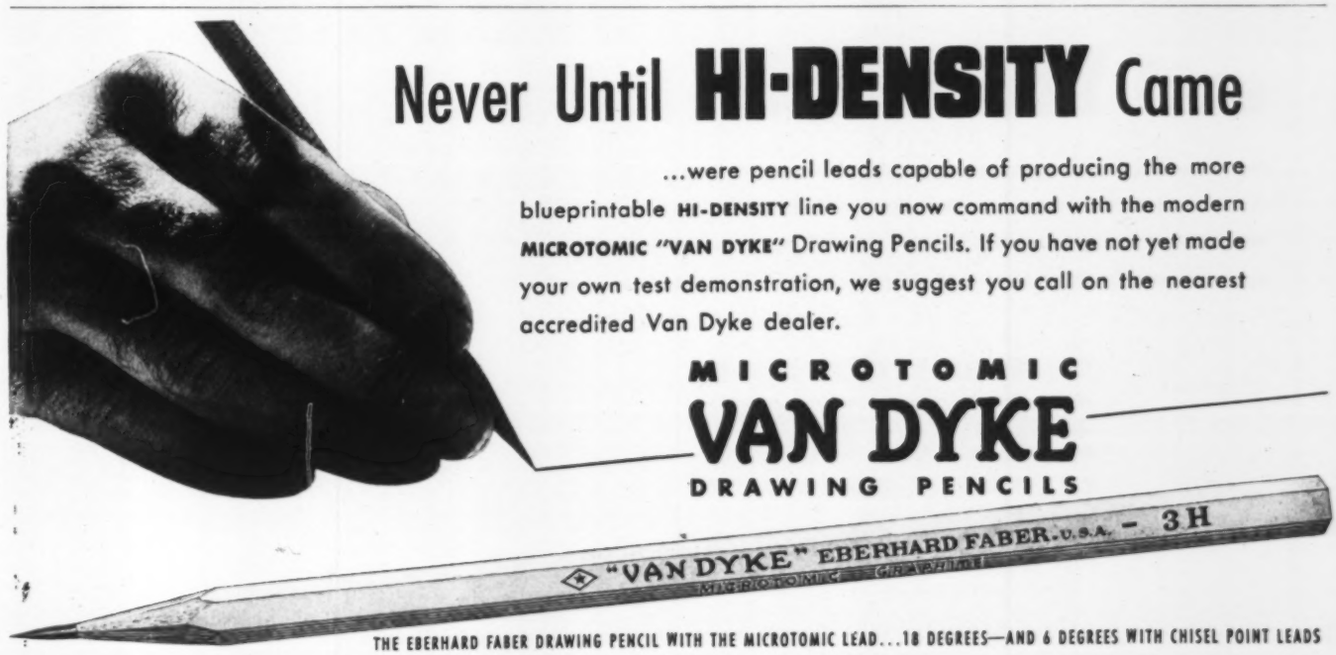

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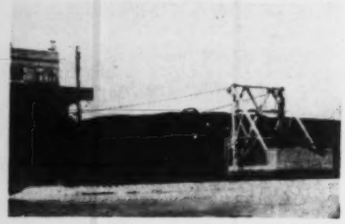

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Along with this feature of safety, a Sauerman installation offers such other advantages as: low first cost, economical upkeep, simplicity of operation.

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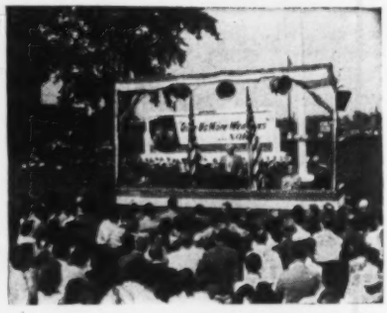
proximately half of this total. So far this year there has been a 30 per cent increase in the amount of scrap going out to dealers who make it available to other war industries.

G-E Schenectady Works Gets Army-Navy Award

"Go on turning out all the war materials you can!" was the message Army and Navy officials brought to several thousand employees of General Electric's Schenectady Works at the presentation of the Army-Navy "E" pennant, September 16. The award was made in a brief ceremony during the noon lunch period.



A moment before the pennant was raised by a special Navy Color Guard, Captain Joseph S. Evans, USN, Inspector of Naval Material at the Works, told war workers who jammed the yard:

"As you pass this pennant, let it be a reminder to renew your determination to turn out all the equipment you can for the fighting forces."

Colonel Carroll Badeau, Army Signal Corps rep esentative at the General Electric Company, joined Captain Evans in congratulating employees for the quality and quantity of war material already produced and in urging still greater production in the months to come.

"You are just as important a part of the fighting forces as the men in the Army and Navy," he said. "They need your services as badly as you need theirs."

A few minutes later both speakers briefly addressed a gathering of the Company's general office workers.

"It is just as important for office workers to do their jobs quickly and well as it is the workers in the plant," said Captain Evans. "If you don't get the paper work done properly and on time it means delays and mistakes in the plant. This award today is a prayer that all of you will keep on producing more and better materials for our fighting forces."

Vice President E. O. Shreve also spoke to the general office workers, praising their "high spirit of morale" and urging them to re-dedicate themselves to the urgency of the task ahead. "The job must and will be done," he promised.

Farrel-Birmingham Company Wins Second All-Navy "E" Award

The Navy Board for Production Awards has announced that a second All-Navy "E" Award has been won by Farrel-Birmingham Co., Inc. of Ansonia, Conn. Each of the company's three plants—at Ansonia and Derby, Conn., and Buffalo, N. Y.—have earned the privilege of flying the Navy "E" burgee with a white star added.

The white star carries a special and added significance, according to Admiral H. A. Wiley, USN (Ret.), Chairman of the Navy Board for Production Awards. He highlighted this point in a letter of congratulation to N. W. Pickering, President of Farrel-Birmingham Co. Admiral Wiley's letter reads in part as follows:

"On behalf of the Under-Secretary of the Navy, I congratulate every man and woman of the Farrel-Birmingham Co. on their patriotic achievement. A Navy 'E' is not lightly bestowed in the first instance; the requirements for renewal are equally exacting. By being selected for the honor a second time you have demonstrated that yours is no half-hearted, flash-in-the-pan effort, but rather a solid determination to supply the Navy with the materials it must have to carry the engagement to the enemy. That's the spirit that has made the nation what it is today. It is the spirit that will win this war."

Farrel-Birmingham Co. manufactures gear drives for ships of the U. S. Navy and U. S. Maritime Commission, besides heavy machinery for use in the war production of steel mills, non-ferrous rolling mills and the rubber, plastics, paper and sugar industries.

Tube Turns Is First Kentucky Plant to Win Army-Navy "E" Flag

Tube Turns, of Louisville, recently won the distinction of being the first war industry plant in the state of Kentucky to receive the coveted Army and Navy "E" flag for outstanding production efficiency.

National, state and local industrial and military leaders attended the brief, colorful ceremonies at the plant on September 18th, at which the award was presented before a crowd of more than 3,000 employees and their families. Individual Army-Navy "E" pins were later distributed to every employee.

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Lubrication of ways—spindle bearings—gear heads—elevating screws—speed reducers—are typical examples where "Sturaco" application has solved tough lubrication problems. If you need help, write or phone today.

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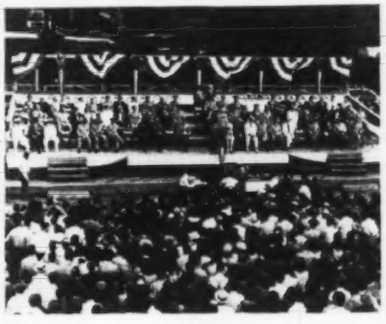
Characteristic of the nation's aroused industrial might, W. H. Girdler, president of the company, said in accepting the award, "we have just begun . . . our production in the next twelve will be three times more than in the past twelve months!"



The employee representative selected to receive the individual Army-Navy "E" pins, on behalf of all employers, declared significantly, "you haven't seen anything yet!"

The Tube Turns company, manufacturers of Tube-Turn welding fittings, and an affiliate of The Girdler Corp., has attracted nation-wide attention in producing a variety of critical forged materials for Army Ordnance, the aviation industry and other vital war purposes, and in maintaining an unusually high degree of employee morale as a contributing factor.

Chicago to Have Largest Magnesium Foundry in World

That the world's largest magnesium foundry with an anticipated monthly production of over 500,000 pounds of castings is rapidly nearing completion in Chicago was disclosed yesterday by Frank C. Howard, president of the Howard Foundry Co., in announcing several important changes in his organization.

Besides his statement that the general offices of this company would soon be moved to the mammoth new magnesium foundry, he made public the recent acquisition of the Aurora Foundry Co., Aurora, Ill., which will hereafter handle the production of all Howard brass, bronze and copper castings, and be known as the Bronze Division of the Howard Foundry Co.

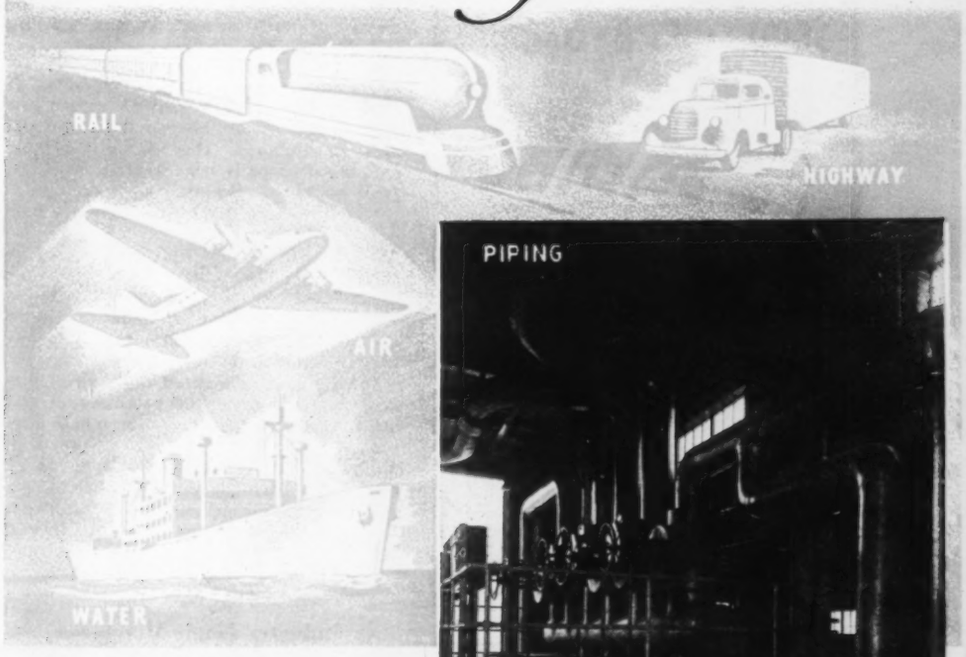
The original Howard Foundry awarded the Army-Navy "E" for excellence in war production not long ago, will be known as the Aluminum Division, and will cast that metal solely. All Howard foundries are engaged 100% on war orders.

In commenting on the new plant, Mr. Howard called attention to the fact that he thought a large production magnesium foundry was needed in the Chicago area. In keeping with Chicago's industrial leadership, he felt that the new plant should be located here. While declining to give specific figures on area of plant, number of employees and other detailed information, he admitted that when the new plant reached its peak, which would be early in 1943, more than half a million pounds of the remarkable new metal would be poured every thirty days.

"Magnesium because of its extreme lightness and remarkable strength, has become a vital war materiel," said Mr. Howard. "It is no secret that all types of pursuit, fighter and bomber planes use a great number of cast parts made of magnesium, and the use of magnesium in airplane construction is rapidly increasing. Magnesium castings, weight for weight, have a normal tensile

Continued on Page 30

The Nation's 5th Carrier . .



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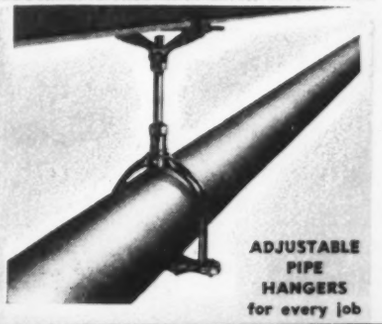
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FULLY as important to industry as air, rai highway or water transportation, is *flui transport.* Upon it depends the supply of steam compressed air and water power... the fas safe handling of chemicals, gas and liquid fuel ... the protection against wartime fire hazards

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strength greater than any other metal, yet they are one-third lighter in weight than aluminum; factors that make magnesium ideal for airplanes. It is readily machinable and, when properly heat treated, develops a great strength. Because of its strength, it is widely used in making parts where lightness is imperative."

"Although the new buildings are not yet completed, furnaces have been set up and molds made wherever we find space and we are producing what we can under the circumstances. As fast as departments are finished, we move into them."

Mr. Howard announced that "already the new plant had developed processes for making magnesium castings of a much larger size than have been hitherto commercially practical. Single castings up to seven and eight feet in diameter will be included as part of the normal output", he said. The Bronze Division of the Howard Foundry Company at Aurora is now producing large brass, bronze and copper castings for naval construction.

Industry Lends Manpower to Salvage Program

More than 3,000 trained field men, loaned by private industry to assist in the industrial salvage program, are augmenting the manpower of the WPB's Conservation Division in the most thoroughly organized search for industrial scrap to date.

This army of field men, donated for 90 days by industry, embraces men recruited from the iron and steel industry, the American Steel Warehouse Association, the Associated Equipment Distributors, and the National Association of Sales Executives. Working closely with the efforts of the Industrial Salvage Section of the Conservation Division, WPB, these men will call on industrial plants throughout the country in the interest of stimulating the scrap program and to insure that all possible dormant scrap is moved. Presidents of 70,000 industrial firms have received notice that they will be called upon by these field men.

Urging industrialists to cooperate with these field men to the fullest, Robert W. Wolcott, Chairman of American Industries Salvage Committee says: "The success of any salvage drive, either community or industrial, can be insured by a house-to-house or plant-to-plant canvass. No other means is so effective. The manpower which is being made available by industry makes possible for the first time a thorough canvass of the industrial plants of the country. There is no telling how much dormant scrap will be produced from this drive, but it is safe to say that the tonnage will be tremendous. I know that industrial managers will cooperate to the fullest when these field men call upon them, for such cooperation will insure the success of the industrial salvage program."

Theme of the drive for dormant industrial scrap is: "If it hasn't been used for the past three months and if no one can prove it will be used in the next three—find a use for it or scrap it."

Service Flag Dedicated by Johns-Manville

A service flag for the 1,792 Johns-Manville men now serving in the armed forces of the United Nations, was dedicated by Lewis H. Brown, president of Johns-Manville Corporation at a ceremony held in New York attended by 800 J-M home office employees. Of the 1,792 men in service, 1,623 are with the American forces and 169 with the Canadian forces.

In dedicating the flag Mr. Brown said, "The J-M Service Flag is a symbol of the great obligation that we here at home face in this war. All of us here at J-M whether we are connected with production, with our sales force or financial department are working to the same end—that of helping to win this war and win it as quickly as possible. No matter what our particular jobs may be at Johns-Manville, we are all in this fight. We stand or fall together to meet the biggest challenge we have ever undertaken."

The ceremony was sponsored by the J-M Women's Defense Workshop, an organization of Johns-Manville women formed as a voluntary service group to assist men who have left the company for the Army and Navy. Miss Augusta Cingolani, co-chairman of the Workshop, presided at the ceremony. Other speakers at the ceremony included Lawrence Impey for fifteen years Far East correspondent of the London Daily Mail, who came to this country recently after witnessing the fall of Singapore and the Japanese attacks on the Dutch East Indies; Dimitri Goulandris, a Greek sailor twice torpedoed in the Atlantic.

Chaplain Earl T. Jennings, U. S. A., pronounced the benediction.

Westinghouse Plants Receive Army-Navy Pennants

Rear Admiral William Carleton Watts of the United States Navy recently presented Army-Navy "E" pennants to five Pittsburgh-area plants of the Westinghouse Electric & Manufacturing Co. "for high achievement in the production of war equipment." Selected to receive the awards were the Transformer Division at Sharon, Pa., and the East Pittsburgh Division, which includes the porcelain

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We conserve metals difficult to replace. We have solved the condensate corrosion problem in steam systems. In the Cook County Nurses' Home in Chicago, where extra heavy wrought iron piping withstood corrosive condensate only thirty days, Haering Glucosates corrected the condition, and test pieces six months later were free from corrosion deposits. We protect metals in boilers, piping, condensers and heat exchanges, too.

The Glucosates also conserve energy. Less fuel is needed—more production obtained—where Glucosates control scale, corrosion and living organisms. The Glucosates save raw materials, too. Less chemicals are used where Glucosates substitute for common inorganic materials.

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plant at Derry, Pa., Nuttall Gearing Works in Pittsburgh's Lawrenceville section, and plants at East Pittsburgh and Trafford, Pa.

Accompanied by Navy and Army officers, the Admiral visited the Derry plant and praised workers for their production of porcelain parts for military communication equipment. The officers also inspected the Trafford works which makes metal castings for electric motors and generators in addition to plastic Army helmet liners and parts for airplanes.

The blue and red Army-Navy flag awarded the East Pittsburgh Division now flies above the giant East Pittsburgh works. Covering almost 80 acres, this plant is now turning out equipment at a rate 60 per cent ahead of 1941—producing generators to create electricity for war plants, motors to drive machinery, and control and switchboard apparatus to regulate electric power.

Admiral Watts inspected the Nuttall plant and addressed the workers who make gears for Naval vessels. Later he presented the production award to the Transformer Division at Sharon, Pa., which manufactures transformers required to step up or step down voltages in the transmission of electric power.

Accompanying Admiral Watts and the military party and serving as master of ceremonies was Milton Cross, widely known announcer for the National Broadcasting Co. At the Derry plant program Mr. Cross introduced Lieut. Commander C. E. Egeler of the United States Naval Reserve who presented Army-Navy pins to four representatives of Derry employes. The representatives were Charles Brown, Jr., Miss Jean Johnson, John Lyons and C. D. Hall.

Army-Navy pins were awarded to all the thousands of employes in Westinghouse plants receiving the production pennants.

Representing employes in the pin presentation ceremonies at the Trafford works were John A. Metcalfe, president of Local 601, United Electrical, Radio, and Machine Workers of America, (C.I.O.); L. F. Bollens, president of the Association of Westinghouse Salaried Employes; Miss Catherine Ochs and John Smith.

At East Pittsburgh, employe representatives included C. H. Smith, Miss Margaret Coburn, Frank C. Russell, Miss Emma Ader, Mr. Metcalfe and Mr. Bollens. Captain F. L. Oliver, United States Navy, retired, presented the pins. At Nuttall, Lieut. Commander Egeler presented pins to Dan McKinnon, Frank Wildman and Miss Catherine Burke, who have served a total of 111 years with Westinghouse.

Three 50-year veterans—Henry C. Bert, James T. Burke and James R. Stevens—received Army-Navy pins at the Sharon ceremonies as representatives of employes. The presentation was made by Lieut. Commander Roy W. Lewis, United States Navy, retired.

The official hosts were W. F. Bailey, manager at the Derry works, and G. S. Ryan, manager of the Feeder Division, in behalf of the Trafford works and its employes. A. C. Streamer, vice president, accepted the pennant at the East Pittsburgh plant. L. R. Botsai, manager of the Gearing Department, was the official host at the Nuttall plant. H. V. Putman, manager of the Transformer Division, expressed appreciation on behalf of the Sharon plant and workers.

A. W. Robertson, chairman of the board, George H. Bucher, president of Westinghouse and many other top ranking executives of the Company attended the various award ceremonies.

Continued on Page 32

• BUSINESS CHANGES

Bailey Meter Company Opens Additional West Coast Branch Offices

Bailey Meter Co. announces the appointment of L. F. Richardson as branch manager of its newly established Los Angeles Office and H. T. Sawyer as branch manager of its newly established Seattle Office. Messrs. Richardson and Sawyer had previously been located in Los Angeles and Seattle but had functioned as representatives of the San Francisco Branch Office.

V. A. Rumble, manager of the Company's San Francisco Branch Office, continues as West Coast Supervisor.

Opening of these two additional branch offices enables the many War Plants located in West Coast areas to more easily secure experienced advice and assistance regarding the proper selection, application and use of boiler room, metering and control equipment.

Collins Appointed Vice President Elastic Stop Nut Corporation

William T. Hedlund, president of the Elastic Stop Nut Corp., announced Oct. 12, the appointment of Whitney C. Collins, as vice president in charge of sales policy. Mr. Collins resides in Beverly Hills, Calif., and has been a director of the company since 1940.

The main plant of the Elastic Stop Nut Corp. is located in Union, N. J. There is a branch plant in Lincoln, Nebr.

In 1932 Mr. Collins, formed the Collins-Powell Co., of Beverly Hills, representing the Elastic Stop Nut Corporation as sales engineers. He was instrumental in developing wide use of elastic stop nuts in the aviation industry.

Mr. Collins was associated with the Lockheed Aircraft Co. from 1928 to 1930, serving as a vice president, treasurer and general manager. From 1922 to 1928, he was affiliated with the Continental Illinois National Bank and Trust Co., Chicago. He is a director of the Menasco Manufacturing Co. and the Radioplane Company.

Mr. Collins, was born in Des Moines, Iowa, on April 28, 1898. He served overseas with the 125th Field Artillery during the first World War. He was graduated from the University of Pennsylvania in 1921, with the degree of Bachelor of Science.

Corpe Now General Sales Manager Elastic Stop Nut Corp.

Thomas H. Corpe, has been named general sales manager of the Elastic Stop Nut Corp., it was announced Thursday, Oct. 22, by William T. Hedlund, president of the company. This concern manufactures a self-locking nut, and has its general offices and main plant in Union, N. J.

Mr. Corpe was formerly assistant general sales manager of the Lockheed Aircraft Corp., and at one time was in charge of sales promotion, advertising and market research for that company. Mr. Corpe has also been associated with General Motors Corp. as a technical engineer at its Proving Ground, and in various sales and promotion positions. He was educated at Oxford and at the University of Michigan. Mr. Corpe resides at Summit, N. J.

Harry F. Boe Elected Vice President

Mr. Harry F. Boe, manager of the Company's District Repair and Manufacturing Department, was elected to the rank of vice president by the Board of Directors of the Westinghouse Electric & Manufacturing Co.

As manager of the Westinghouse District Repair and Manufacturing Department with headquarters in East Pittsburgh, Mr. Boe directs the largest industrial organization of its kind in the country, supervising the operations of 35 plants located in strategic industrial centers from coast to coast. These plants are now manufacturing large quantities of new equipment for war industries and the armed services as well as maintaining and servicing electrical apparatus already at work in industry.

Mr. Boe began his career with Westinghouse in 1901 as a winder of motor armatures in the shops at the Company's East Pittsburgh works.

He was born in Mansfield, Ohio, May 12, 1884, the son of Henry C., and Margaret Foster Boe. He was educated in the public schools of Massillon, Ohio, and studied electrical engineering at night school at Carnegie Institute of Technology, in Pittsburgh, while working during the day in the testing department at the East Pittsburgh works.

Following seven years' experience in testing electrical equipment, Mr. Boe was transferred to the Company's general engineering department and later became a sales engineer in the general industrial division. In 1918 he was appointed industrial salesman in the Company's office at Rochester, N. Y. In 1922 he was named manager of the Industrial Division of the Buffalo Office and in 1927 was made manager of the Buffalo Branch Office.

Guard precious war drawings with this special-process tracing cloth

Mistakes mean delays, and America's wartime job is to *speed* production! Give war jobs the best! That means specially-processed Arkwright Tracing cloth. Arkwright is made by a highly technical method on costly machines. The surface is clear, smooth – never "humpy." Ink lines won't spread or "feather" – nor crack or chip in drying. Years from now, drawings will be fresh and clear – truly permanent! Guard your war work this way. Arkwright Finishing Company, Providence, R. I.

Arkwright TRACING CLOTHS

AMERICA'S STANDARD FOR OVER 20 YEARS

• Keep Informed

Mr. Boe was promoted in 1935 to manager of the Company's Eastern District, with headquarters in New York City. Two years later he was transferred to Pittsburgh as commercial manager of Westinghouse, and the following year was appointed manager of the Company's Service Department, later reorganized as the District Manufacturing and Repair Department.

Mr. Boe received the Westinghouse Order of Merit in March 1941, with this citation: "Particularly for his spirit of good will under all circumstances; for his high quality as a Westinghouse salesman; for the inspiration he imparts to his men scattered all over the country, and for the harmony he has developed between his own and other departments."

H. V. Putman Elected Vice President

Mr. H. V. Putman, manager of the Company's Transformer Division, was elected to the rank of vice president by the Board of Directors of the Westinghouse Electric & Manufacturing Co.

Mr. Putman was appointed manager of the Westinghouse Transformer Division, largest transformer plant in the country, in November 1940. Transformer production to meet the requirements of expanding war industries and power stations has more than doubled in the past two years.

Mr. Putman was born in Barker, N. Y., in 1899, the son of Frank V. and Mary C. Putman. He was graduated from Union College, Schenectady, N. Y., in 1920, with the degree of bachelor of science in electrical engineering. In 1921 he received his master's degree from Union College, and the degree of doctor of philosophy in 1923.

Two years after completing his college work, Mr. Putman joined Westinghouse as a design engineer on synchronous motors, at the Westinghouse East Pittsburgh Works. As section engineer in charge of synchronous motor design he developed the simplex synchronous motor which is adaptable to all low speed drives requiring high starting torques with low starting current.

In 1930, Mr. Putman was transferred to Sharon as assistant manager of the Transformer Division's engineering department and two years later was promoted to manager of engineering.

In April 1939, Mr. Putman received the Westinghouse Order of Merit for distinguished service. The award, voted by the Company's Board of Directors, consists of a bronze medal bearing a silver "W", and a citation: "For the thoroughness of his engineering ability; for his vision in product development; for his high qualities as a leader, and for his ability to bring a broad and rich experience to bear on new problems."

New Post for Earl Wesselhoff of Morse Chain Co.

Walter Bertram, Sales Manager of Morse Chain Co., Ithaca, N. Y., announces the new appointment of Earl Wesselhoff as manager of the Boston Branch to succeed C. L. Pratt, Jr., who has resigned.

Mr. Wesselhoff goes to the Boston Branch from the Detroit plant where his first association started twenty-two years ago as automotive timing chain drive engineer. Mr. Wesselhoff had much to do with the early development and application of silent automotive timing chain drives. Since he joined Morse he has served in several engineering capacities and was subsequently promoted to the dual position of chief engineer plus the sales directorship of the Morse Indexing and Free-Wheeling Clutch Lines. He has had

Continued on Page 34

Why Manganese Steel Sheaves *Increase Service Life* of Wire Rope

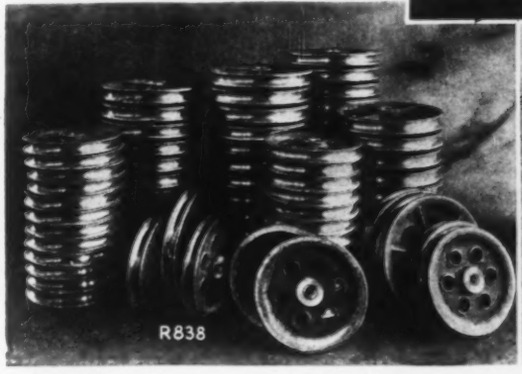
The published recommendations of the producers of wire rope contain much valuable data concerning sheave and groove dimensions, regrinding grooves to remove corrugations, and the sheave metal least destructive to the cable. Most of them give 13% manganese steel the highest rating. When a sheave groove is soft enough to score, microscopic splinters are produced that enter the rope strands, forming a highly destructive abrasive compound with the lubricant.

Manganese steel sheave grooves are not subject to this objection to nearly the same extent as those in ordinary iron or steel sheaves. The surface metal quickly work-hardens and polishes under friction and pressure, reducing cable abrasion to a minimum. In fact, the user of 13% manganese steel can generally expect a 25% longer life from his wire rope.

The body metal of the sheave is extremely tough so that breakage under shock or stress is seldom experienced. In the most difficult services manganese steel sheaves have a sufficiently longer life than ordinary wheels to justify their higher cost, without regard to the additional saving in wire rope consumption referred to above. Some typical Amsco manganese steel sheaves are pictured here:

Double groove wheels (R-727) for a steel plant ladle crane hoist; sheaves (with graphite bronze bushings pressed in) for use in tackle blocks and on steering gears on coastal vessels (R838), and sheave or closing wheel for 7 yd. dredge clamshell (R809).

Other types of sheaves, wheels, rollers, sprockets and gears made of "the toughest steel known" are shown in Bulletin 842-WS, which also gives much information concerning the properties and uses of manganese steel. May we send you a copy?



Amsco

AMERICAN MANGANESE STEEL DIVISION
OF THE AMERICAN BRAKE SHOE & FOUNDRY CO.
Chicago Heights, Illinois

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Genuine Manganese Steel, "The Toughest Steel Known"
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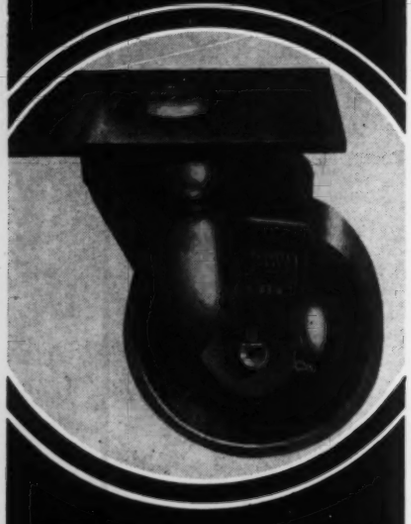

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CASTERS & WHEELS

Whether for light, medium or heavy duty use, Darnell Casters and Wheels are built to take punishment.

Built-in quality assures a long life of efficient service—it pays to "Demand Darnell Dependability".

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a long and extended career in the industrial power transmission field as well as in automotive timing drives.

For several years Mr. Wesselhoff has been identified with many engineering improvements in the Morse line of Indexing and Free-Wheeling Clutches. He performed noteworthy engineering in pioneering the development of practical dual-drive hook-ups involving combinations of prime movers such as turbines, electric motors, and engines for driving centrifugal water pumps and forced and induced draft fans, etc. He also achieved success in working out practical principles and applications for utilizing standardized, high speed gas and diesel engines by efficiently harnessing and automatically controlling them through multiple hook-ups of from one to twelve engines to produce a single source of dependable and economical power.

In the new post, Mr. Wesselhoff, known to his many friends as "Wess," will make his quarters in Boston, from which he will service Morse Chain Co. accounts throughout the New England States in a sales, engineering and service capacity.

Norton Appointed Sauerman New York Distributor

Sauerman Bros., Inc., Chicago, Illinois, manufacturers of long range material-handling machinery, announce the appointment of J. R. Norton, 11 W. 42nd Street, New York N. Y., as distributor to succeed W. R. Elden who died recently. Mr. Norton is well known to the buyers of construction and mining machinery in the New York district, having maintained a sales office there for a number of years.

Ralph Brady Heads Commercial Engineering at Westinghouse

David S. Youngholm, vice president, has announced the appointment of Ralph R. Brady as manager of the commercial engineering department, Westinghouse Electric & Manufacturing Company's Lamp Division, Bloomfield, N. J. Mr. Brady succeeds D. W. Atwater, recently appointed manager of the new illuminating engineering department.

Mr. Brady brings to his new position more than 25 years of engineering experience. Following the first World War in which he served in the Signal Corps and saw active service at St. Mihiel and the Argonne, he became manager of the Electrical Testing Laboratories Bureau in Bloomfield.

He joined the Westinghouse Lamp Division in 1929 as assistant test engineer and in 1934 was made head of all large lamp commercial activities, a position he held until his present appointment.

Mr. Brady is affiliated with numerous national organizations including the American Society of Naval Engineers, the Illuminating Engineering Society, the National Aeronautic Association, the American Transit Association, the Association of American Railroads and the American Legion.

J. L. Townsend Advanced in G-E Motor Division

J. L. Townsend has been appointed Assistant Manager Sales, Fractional-horsepower Motor Section, of General Electric's Motor Division, it was announced recently by W. H. Henry, Manager of the Motor Division, Industrial Department.

A native of Syracuse, N. Y., Mr. Townsend was graduated from Syracuse University with a degree in Electrical Engineering in 1925, and later that year joined General Electric as a student engineer at the Ft. Wayne Works.

Early in 1926, he was transferred to the Fractional-hp Motor Sales Dept., Ft. Wayne Works, and later that year to the same department in the Company's Chicago Office. During the period from 1926 to 1937 he was located in the Detroit and Grand Rapids Offices. In 1937, he was reassigned to the Fractional-hp Motor Sales Section at the Ft. Wayne Works.

E. S. Coe, Jr., New Manager of Farrel-Birmingham Co. New York Office

Farrel-Birmingham Co., Inc. of Ansonia, Conn. and Buffalo, New York, announces the appointment of Edward S. Coe, Jr. as manager of its New York office at 79 Wall Street, to succeed Mr. E. H. Thomas, recently deceased.

To his new post Mr. Coe brings a varied experience and knowledge of the company's products gained in a number of positions he has held in the company since 1936.

Following two years at the Buffalo plant on gear sales he spent a brief period at the New York office and then over a year as sales engineer in the Chicago office. The next

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Weld Testing—Qualification of Operators—Supervision—Inspection—Research.
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BERNARD R. SCHNEIDER
621 Sixth Avenue, Lyndhurst, N. J.

RATE Announcements under this heading in MECHANICAL ENGINEERING are inserted at the flat rate of $1.25 a line per issue, $1.00 a line to A.S.M.E. members, minimum charge, three line basis. Uniform style set-up. Copy must be in hand not later than the 10th of the month preceding date of publication.

three years were spent at sales engineering at the company's main office in Ansonia. For the past few months he has been in charge of expediting production of Farrel-Sykes gear generating machines.

Born in Worcester, Mass., Mr. Coe received his early education there and graduated from Worcester Polytechnic Institute in 1931 with a degree of Civil Engineer. Following his graduation he worked at the Trenton and Worcester plants of American Steel & Wire Company for four years before joining Farrel-Birmingham Co.

George Anderson Made Field Engineer

The National Forge & Ordnance Co., Irvine, Warren County, Pa., announces the promotion of George E. Anderson as field engineer. Mr. Anderson will cover the Western Pennsylvania, Western Maryland, West Virginia and Western Virginia territories.

George Anderson has been connected with National Forge for thirteen years. For the past six years he has been in the sales department handling estimating and advertising. For the first seven years he was in the plant production department. This combined shop and sales department experience makes Mr. Anderson well qualified to serve National Forge customers as field engineer.

Jenkins Manager Twin Disc Clutch Hydraulic Division

The Twin Disc Clutch Co., Racine, Wis., announces the appointment of John B. Jenkins as manager of the Hydraulic Division, Rockford, Illinois.

For the last eight years, Mr. Jenkins has been in charge of the company's factory branches at St. Louis, Tulsa and Dallas.

The active field experience which he brings to this position plus his previous experience at the Twin Disc factory in Racine, will assure Twin Disc customers a sympathetic understanding of their problems and the complete co-operation of the Hydraulic Division

• LATEST CATALOGS

General Electric Issues New Bulletin on Ignitron Mercury-Arc Rectifiers in the Steel Industry

"Ignitron Mercury-arc Rectifiers in the Steel Industry" is the title of an attractive 28-page bulletin (GEA-3827) recently issued by the General Electric Co.

Profusely illustrated, the bulletin outlines various conversion-equipment problems in the steel industry, and discusses the characteristics and the various applications of ignitron mercury-arc rectifiers in meeting these problems. Among the subjects discussed in the bulletin in reference to steel mills are d-c power supply, d-c systems, 250-volt distribution systems, 600-volt continuous mill systems, and reversing mill systems.

Also discussed are the three types of conversion units commercially available to supply power to large d-c systems in steel mills: the synchronous converter, the motor-generator set driven by either a synchronous or an induction motor, and the ignitron mercury-arc rectifier.

Accompanying diagrams show cross sections of the rectifier, comparative efficiencies of the three types of power-conversion units, effect of phase control on output-voltage and output-current wave shapes, and a floor plan illustrating a typical 1500-kw, 250-volt ignitron mercury-arc rectifier installation.

Chip Breaker Designs

McKenna Metals Co., 367 Lloyd Ave., Latrobe, Pa., has available on request Bulletin 442 entitled "Chip Breaker Designs" which was written by W. L. Kennicott, Tool Engineer, McKenna Metals Co. This bulletin contains the correct types of chip breakers and how to achieve them for various jobs. The four pages contain diagrams supplementary to the descriptive materials.

Standard, Non-Standard and Special Kennametal Tools

Tools with longer tips, new tool styles and applications are announced by the McKenna Metals Co., 367 Lloyd Ave., Latrobe, Pa., in their Catalog 43 which lists substantially reduced prices effective October 5, 1942.

This Catalog illustrates standard, non-standard, and special tools. It also contains diagrams which show the correct rake angles for tools made with Kennametal standard blanks. For each style of standard tool illustrated an operational illustration shows the proper use of the tool. The 40-page Catalog is sectionalized and concerns itself with (1) Standard Tools, (2) Typical Non-Standard Tools, and (3) General Information.

The informative section gives specific information concerning the Origin and Qualities of Kennametal, How to Specify and Order Tools and Blanks, Chip Breakers for Tools,

Continued on page 36

AIR BORNE DESTRUCTION

Can Come Inside Industry Too!

Bombs that rain from the sky take a terrific toll in destroyed property and lost lives. So every device is being used to protect industry and keep the wheels of production turning smoothly and swiftly.

But, the enemy WITHOUT is not the only destructive force which must be eliminated. Dust—like enemy bombs—dangerous and destructive, but much more insidious in the way it attacks—is the air-borne menace that strikes from WITHIN. Dust ruins irreplaceable machinery, spoils materials in process and impairs workers' efficiency.

Hundreds of existing plants and practically all new war production plants are now equipped with AAF air filtration and dust control equipment.

If you have a dust problem, our engineering service is available without obligation. Offices are maintained in 53 cities located throughout the country for the convenience of industry. Write direct for your copy of "AAF in Industry", a book which describes the complete line of AAF equipment.

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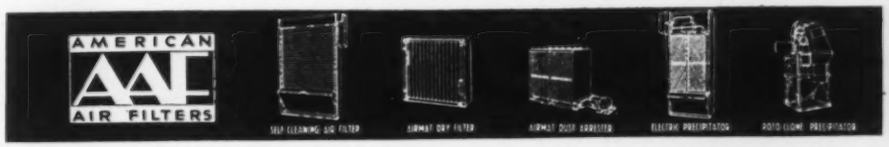
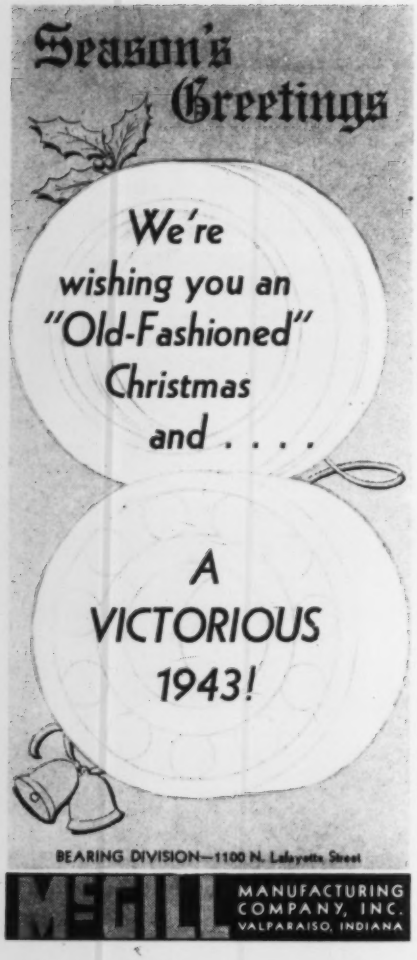




A De Laval-IMO *Rotary Displacement* OIL PUMP with steam-turbine drive is always ready and will run as long as there is steam pressure. The unit shown is for fuel oil booster service. It includes a worm gear speed reduction and is arranged to be mounted on a bulkhead. The turbine and gear are designed for continuous, reliable operation, having a lube oil circulating pump, combined oil cooler and filter and sight flow indicator, as well as mechanical governor and steam pressure release valve on the turbine casing. IMO delivers any oil in any volume against any pressure.

Ask for Publication 1-101

IMO PUMP DIVISION
of the De Laval Steam Turbine Company
Trenton, New Jersey

• Keep Informed . . .

Grinding Tools, How to Avoid Grinding Cracks, Brazing Standard Blanks to Tool Shanks, Milling Steel with Tipped Cutters of Simple Design, Special Applications of Kennametal, and Illustrations of Examples of Machining Operations performed with Kennametal.

A copy of this Catalog may be obtained on request, if the person making the request gives the name of the company by which he is employed.

Solderless Terminal Lugs

Krueger & Hudepohl, Walsh Building, Cincinnati, Ohio, announce New Bulletin 8-D and 8-E which describes K & H Folding Double Cupped and Single Cup Washer Lugs, for wire sizes No. 18 to 6. Also Narrow and Square Folding Lugs for use with wire sizes No. 8 to 4, inclusive.

This Bulletin is profusely illustrated, showing lugs actual size, and embodies all the newest items in their line. To manufacturers of electric appliances this Bulletin should prove of great interest.

Arc Welding Handbook

"Procedure Handbook of Arc Welding Design and Practice," published by The Lincoln Electric Co., Coit Road & Kirby Ave., Cleveland, Ohio, world's largest manufacturers of arc welding equipment, new and enlarged seventh edition, price postpaid United States $1.50 per copy, elsewhere $2.00 per copy, 1,308 pages, 1,810 illustrations. Standard reference guide on arc welding for schools, colleges, technicians, industrial plants, etc.

Thoroughly covers welding technique; procedures, speeds and costs; structure and properties of weld metal; weldability of metals; designing for arc welded construction of machinery and structures; and typical applications of arc welding. Contents arranged in 8 sections with 13-page index. Size: 6 × 9 inches. Cover: Semi-flexible, simulated leather, gold embossed.

"Contribution to Victory"

Ampco Metal, Inc., Milwaukee, Wis., is distributing a new 8-page booklet entitled, "Contribution to Victory."

The booklet describes pictorially the use of Ampco Metal by the War Industries. Printed in two colors it contains views of various types of War equipment containing Ampco bronzes, as well as pictures of weapons of War made with Ampco-equipped machine tools.

Copies will be sent on request to engineers interested in bronze applications.

Air Filtration and Dust Control

A new bulletin has been issued recently by the American Air Filter Co., Louisville, Ky., entitled "AAF in Industry." This company has contributed appreciably to the science of "Dust Engineering." For the past twenty years its efforts have been devoted exclusively to the study of dust, the analysis of dust problems and the development of dust control equipment.

To illustrate the wide application of AAF products in industry, a few of the more general industrial problems and their solutions are presented in this booklet.

Vinylite Plastics for Wire and Cable Insulation

The Halowax Products Division of Union Carbide and Carbon Corp., New York, N. Y., has just released a new 12-page booklet, "Vinylite Plastics for Wire and Cable Insulation." The booklet reviews the important advantages that derive from the use of Vinylite resin compounds for wire and cable insulation from the standpoints of installation, service, and safety.

This new synthetic resin insulation is now being used for most of the purposes previously served by rubber. It has already made possible important changes in wire design and application.

The booklet describes the practical advantages of wire and cable insulation made from Vinylite plastics and contains tables indicating the physical and electrical properties of the compounds, and typical applications.

Readers may obtain copies by writing on their business letterheads to Halowax Products Division, Union Carbide and Carbon Corp., 30 East 42nd Street, New York, N. Y.

COMING MEETINGS AND EXPOSITIONS

For the next three months

DECEMBER

Nov. 30–Dec. 4	The American Society of Mechanical Engineers, 63rd Annual Meeting, Hotel Astor, New York, N. Y.
Nov. 30–Dec. 2	American Society of Refrigerating Engineers, Annual Meeting, Hotel Commodore, New York
Nov. 30–Dec. 4	Society for the Advancement of Management, Annual Conference, New York
Nov. 30–Dec. 4	15th National Power Show, Exposition of Power and Mechanical Engineering, Madison Square Garden, New York, N. Y.
7–9	American Society of Agricultural Engineers, Fall Meeting, La Salle Hotel, Chicago, Ill.
28—Jan. 2	American Association for the Advancement of Science, Annual Winter Meeting, Hotel Commodore, Pennsylvania, etc., New York

JANUARY, 1943

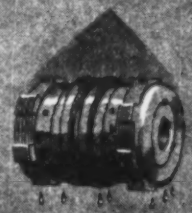
11–15	Society of Automotive Engineers, War Production-Engineering Meeting and Engineering Display, Book-Cadillac Hotel, Detroit, Mich.
19–26	American Boiler Manufacturers Assoc. & Affiliated Industries, Mid-Winter Meeting Hotel Cleveland, Cleveland, Ohio
20–21	American Society of Civil Engineers, Annual Meeting, Engineering Societies Building, New York, N. Y.
25–27	American Society of Heating and Ventilating Engineers, Annual Meeting, Hotel Gibson, Cincinnati, O.
25–29	American Institute of Electrical Engineers, National Technical Meeting, Engineering Societies Building, New York, N. Y.

FEBRUARY

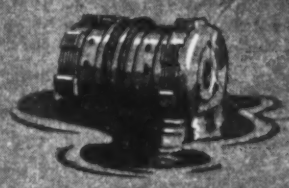
11–12	The Engineering Institute of Canada, 57th Annual General Meeting, Royal York, Toronto, Canada
12–13	Steel Founders' Society of America, Annual Meeting, Edgewater Beach Hotel, Chicago, Ill.
14–18	American Institute of Mining and Metallurgical Engineers, Annual Meeting, Engineering Societies Building, New York, N. Y.
15–18	Technical Association Pulp & Paper Industry, Annual Meeting, Hotel Commodore, New York, N. Y.

For Calendar of coming A.S.M.E. Meetings see page 920 in the editorial section.

For "wet type" clutches use proven engine oil of S.A.E. viscosity 10 or 20, in no case to exceed 30.



Lubricate clutch by running a spray of oil over the complete clutch



or by allowing clutch to dip in sump. Dip clutch in no more than 1 inch, nor less than ½ inch of oil.

DON'T USE CUTTING OILS FOR LUBRICATION

These two routine maintenance practices will assure maximum performance and work-life for your Twin Disc Machine Tool Clutches:

1. Regular lubrication with the correct amount and proper grade of lubricant.

2. Proper adjustment as shown on the instruction plate.

The ideal lubricant for any of the "wet type" Twin Disc Machine Tool Clutches is a proven engine oil, manufactured by a reputable refiner. S.A.E. 10 or 20 is best, but in no case should the viscosity exceed 30.

Do not use cutting oils for lubrication. Most cutting oils develop an acid condition which is very harmful to the bronze driving plates in the "wet type" Twin Disc Machine Tool Clutches. The acid attacks the bronze and will eventually cause the failure of the bronze plates. TWIN DISC CLUTCH COMPANY, Racine, Wisconsin.

Twin Disc Machine Tool Clutches, single or duplex, to run dry or in oil. Sizes 2½" to 12".

Illustrated at bottom left, MT Single Machine Tool Clutch. At right, MTU Duplex Machine Tool Clutch.

ARE YOUR *Machines* CO-OPERATING TOO ?

Teamwork—a prime essential in today's Effort world-wide—is as vital with machines as with men. Continuous high-speed *production* demands continuous *co-operation,* with materials traveling in a steady flow from one process to the next.

In an important Mill, large Cleveland Worm Gear Speed Reducers have operated day and night since 1927—driving equipment which operates in series and must be synchronized exactly. With nearly 15 years' experience, the General Manager reports:—

"Cleveland Drives maintain more uniform tension between the unit sections of our equipment and increase our production."

With Cleveland, teamwork begins in our own Engineering and Manufacturing Facilities and extends to the successful application of standard type Worm Gear Units to the machines of all Industry. Clevelands will keep your *machines* co-operating too.

The Cleveland Worm & Gear Company, 3264 East 80th Street, Cleveland, Ohio.

Affiliate: The Farval Corporation, Centralized Systems of Lubrication

In Canada: PEACOCK BROTHERS LIMITED

CLEVELAND WORM GEAR
Speed Reducers

The Standards COLUMN

News of Interest to Manufacturers

Engineering and Scientific Graphs for Publications

THE American Society of Mechanical Engineers takes pleasure in announcing the submission of the proposed American Standard for "Engineering and Scientific Graphs for Publications" to the American Standards Association for approval and designation as an American Standard. This project is the third to have been completed by the Sectional Committee on Standards for Graphic Presentation, Col. W. T. Chevalier, Chairman. The first was the present American Recommended Practice for "Engineering and Scientific Charts for Lantern Slides", approved and published in November, 1932, and the second was the present American Standard for "Time-Series Charts—A Manual of Design and Construction", approved and published in November, 1938.

The purpose of this new proposed standard is to present in a unified arrangement the best practices for the preparation of graphs intended for reproduction in engineering and scientific publications. Attention is directed chiefly to the most common variety of engineering and scientific graphs, i. e., line graphs that show the relationship between two variables in rectangular coordinates. However, many of the principles and recommended practices given in this standard are applicable to other types of graphs and other coordinate systems.

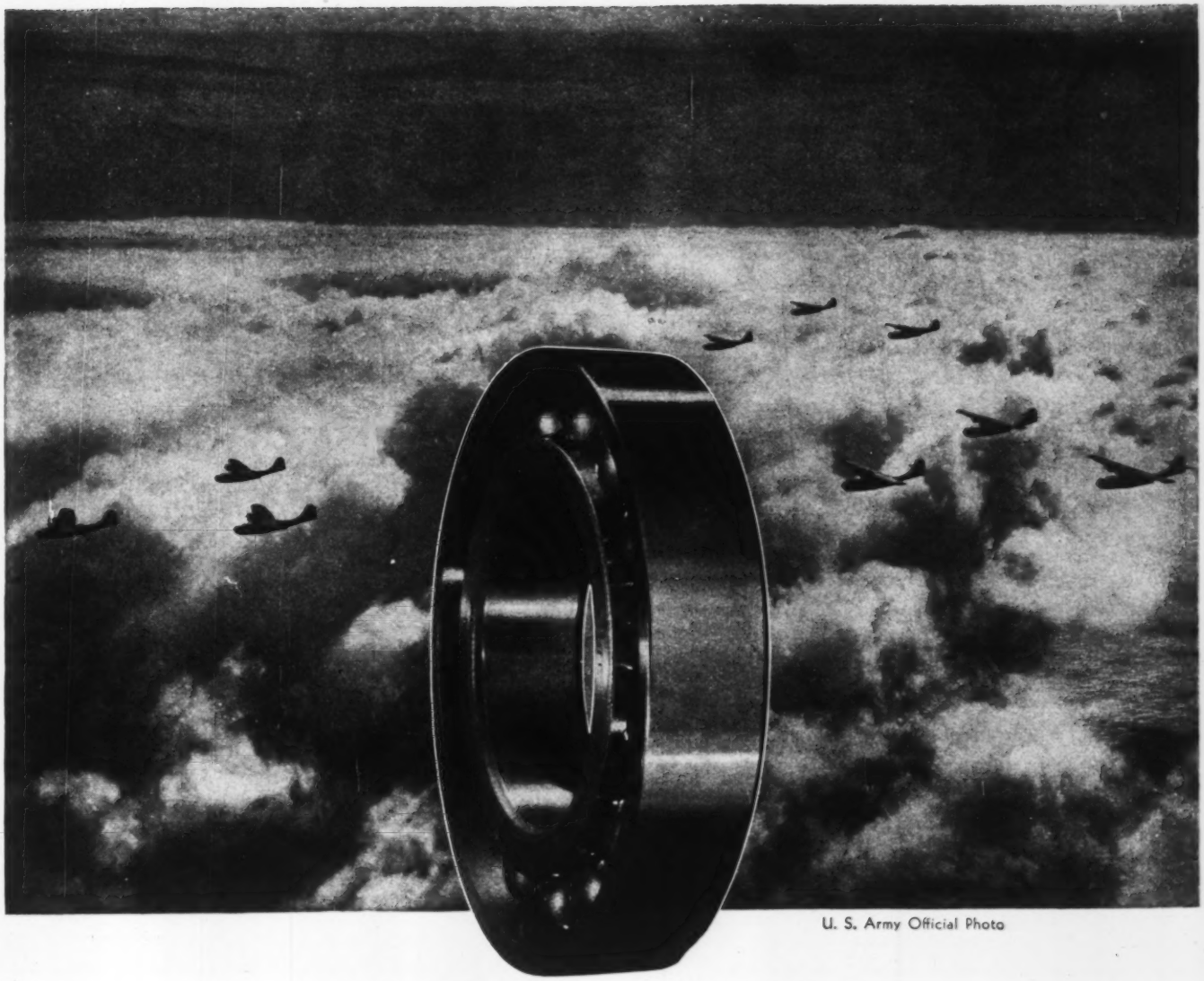
The readers of *Mechanical Engineering* who prepare technical or scientific papers, which are to be eventually submitted for publication, frequently have need to draft or have drawn graphs to show (a) an observed relationship giving a point-by-point plot of the data obtained by experiment or investigation, (b) an empirical relationship giving a curve that reflects the author's interpretation of his series of observations, with or without a point-by-point plot of the observed values, or (c) a theoretical relationship giving a curve alone or a curve accompanied by a point-by-point plot of observed values to show consistency of observation with theory.

In other words, when used to present facts, interpretations of facts, or theoretical relationships, a graph usually serves as an efficient symbol to communicate knowledge from the author to his readers in order to induce a desired reaction. However, a graph should be used only when it will convey information and induce the desired reaction more effectively than words or tabulations. The preparation of such a graph deserves and usually requires at least as much time as the preparation of the equivalent area in text.

This proposed standard is subdivided into three parts: Part 1—Design and Layout; Part 2—Construction of Original Graph; and Part 3—Handling of Finished Illustrations.

For further information—Address

The American Society of Mechanical Engineers
29 West 39th St., New York, N. Y.



U. S. Army Official Photo

In Freedom's Fight

In every warplane that leaves the ground, you will find them. In heavy but fleet and agile tanks, you will find them. In guns and ships and other implements of war, you will find anti-friction bearings wherever shafts turn.

Our modern, mechanized army could not move without anti-friction bearings — without ball bearings. Keep 'em rolling! *Nothing rolls like a ball!*

In this country and beyond the seas . . . in machines of war and in machines that make them . . . millions and millions of New Departure ball bearings are engaged in Freedom's Fight, — which we will win.

● Special bearings may seriously delay vital war production. We ask designers to select standard types and sizes, as far as possible.

MEN AND WOMEN OF

New Departure

THE FORGED STEEL BEARING

● Responding to today's demand for near-perfection, New Departure research workers are gaining new engineering knowledge about bearing design and application for the benefit of all mankind when Peace returns.

NEW DEPARTURE • DIVISION OF GENERAL MOTORS • BRISTOL, CONNECTICUT

MECHANICAL ENGINEERING, December, 1942, Vol. 64, No. 12. Published monthly by The American Society of Mechanical Engineers, at 20th and Northampton Sts., Easton, Pa. Editorial and Advertising departments, 29 West 39th St., New York, N. Y. Price 75¢ a copy, $5.00 a year; to members and affiliates, 50¢ a copy, $4.00 a year. Postage to Canada, 75¢ additional, to foreign countries $1.50 additional. Entered as second-class matter December 21, 1920, at the Post Office at Easton, Pa., under the act of March 3, 1879. Member of the Audit Bureau of Circulations.

Call Clarage!

for EXPERT HELP on any WAR-TIME AIR-HANDLING PROBLEM

To give ***immediate assistance*** to our Government—and to industry engaged in vital war-time production — Clarage maintains sales-engineering offices at all the strategic points indicated on the map above.

Each Clarage branch office is ***manned by experts*** — by capable engineers long experienced in successfully meeting air-handling requirements of every conceivable kind.

On hundreds of America's fighting and cargo ships, in Army tanks, and in war plants from coast to coast — wherever DEPENDABLE ventilation, cooling, mechanical draft, etc., are essential — ***there fans, blowers and allied equipment built by Clarage play their part.***

We're on our toes to help you! We're trying hard to maintain a prompt, intelligent, satisfactory war-time service — all the way from initial recommendation to delivery.

It will pay you to dial our number in your city, or phone or write the factory at Kalamazoo.

COMPLETE AIR CONDITIONING
•
COOLING
•
VENTILATION
•
FACTORY HEATING
•
MECHANICAL DRAFT
•
FANS and BLOWERS for INDUSTRIAL NEEDS

Clarage Fan Company Kalamazoo, Mich.

APPLICATION ENGINEERING OFFICES IN ALL PRINCIPAL CITIES

It Takes a Beach-Head to Start an Invasion

This welded steel amphibian tractor is the Marines' answer to tough "competition" that beat us to the offensive, then dug in.

ALTER EGO: Those few Marines may not win the war by themselves, but they will establish a beach-head and that's a mighty vital prelude to dislodging Axis "competition".

Yes, war is like that. Business now is somewhat like that. Business after the war will be just like that!

ALTER EGO: Right. To win the Battle for Business after this war we're going to have to get on the offensive with welded steel products.

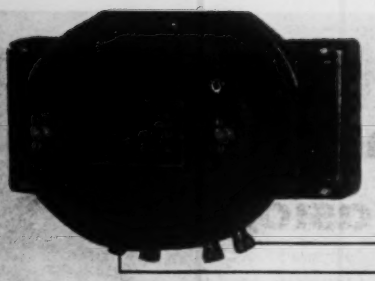
Right. But first we must establish our beach-heads of welding knowledge. Let's start this prelude to invasion of the post-war market NOW.

Ask *your* inner self if a "beach-head" of welding knowledge shouldn't precede post-war market invasion.

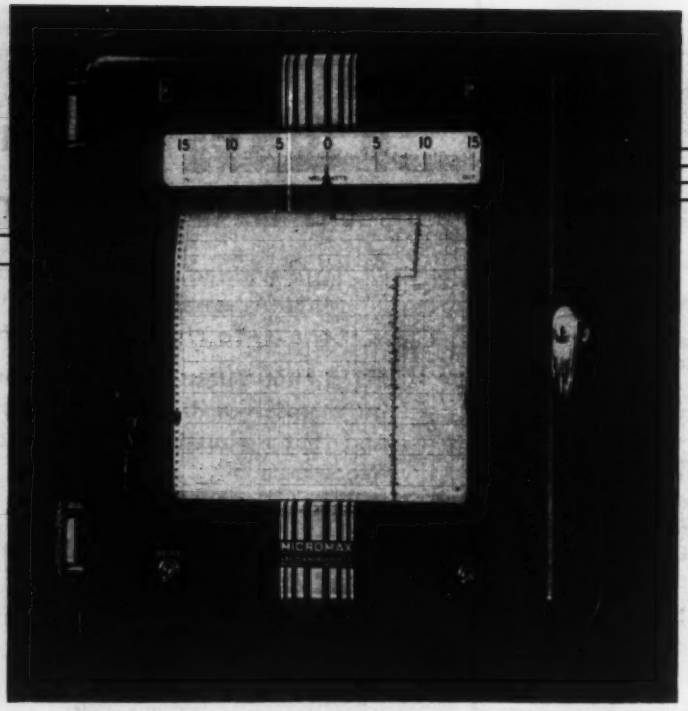
THE LINCOLN ELECTRIC COMPANY
CLEVELAND, OHIO

then I said to myself—

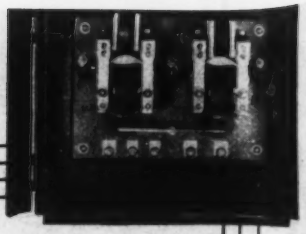
MARINES and WELDING
—the situation will be well in hand



Lincoln Thermal Converter. Detects value of load and reports it to Micromax Controller.



Micromax Recording Controller for tie-line load. Measures tie-line load, and sends correcting impulses to governor-motor contactors when actual load differs from scheduled load.



Governor Motor Contactors.

Unit-Selector Switch Enables operator to assign tie-line control to any generating unit.

TIED IN WITH A UTILITY?
Here's the Tie-Line Control You'll Need

Industrial power plants which are tied in with a public-utility or other power network much larger than themselves can use the Micromax Tie-Line Load Controller to maintain, automatically, any desired interchange of load, and also to record the amount of power which changes hands. No alterations in the generator-governor are required; the Micromax Load Recorder simply operates the synchronizing motor on the governor, just as a man would do. In addition to being continuous and fully automatic, however, the mechanism detects and acts on load changes while they are still too small to show on a wattmeter, and so the Controller brings a new order of precision to the job of load-regulation.

This Controller is, mechanically, a standard Micromax, like those employed for temperature, frequency, voltage, salinity and many other conditions. Its load detector, the Lincoln Thermal Converter, is also a standard device on public-utility systems; it has no moving parts and requires no maintenance. The whole equipment can be installed by an electrician or instrument man.

If you have a tie-line load problem on which this Controller could apply, outline it and we will send further information.

Jrl Ad N-56-161(3)

LEEDS & NORTHRUP COMPANY, 4963 STENTON AVE., PHILA., PA.

LEEDS & NORTHRUP

MEASURING INSTRUMENTS · TELEMETERS · AUTOMATIC CONTROLS · HEAT-TREATING FURNACES

HERE'S SOMETHING TO HELP YOU *Clear the Air*

HANDBOOK OF SPECIAL STEELS

Newly revised and reprinted—a comprehensive book on the properties, uses, and best methods of handling, treatment, etc. of tool, stainless and other alloy steels. Plenty of tables to facilitate quick reference and selection. 128 pages, pocket-sized, latest data.

ELEMENTARY DISCUSSIONS: TOOL AND STAINLESS STEELS

Informative booklets giving clear, detailed data on the various types of tool and stainless steels, their properties and handling. Excellent for training courses in metals and metalworking.

THE lack of information can throw a pretty effective smokescreen around jobs on the production lines. After all, it's about the same as on the firing line—you can't hit them if you can't see them.

Your plant is probably no exception to the general run of war producers. All have a steady job on their hands of training a stream of new men and apprentices in specialized machine operations or other fabricating procedures. Where the needed information concerns alloy steels, you'll find invaluable the publications listed in the panel to the left.

They're primarily for production men. For engineers and designers, complete and certified technical data on the various types of stainless and tool steels is available in Allegheny Ludlum "Blue Sheets." ● Write for the information or the personal assistance you need.

Allegheny Ludlum
STEEL CORPORATION
GENERAL OFFICES: PITTSBURGH, PENNSYLVANIA

A-8677 . . . W & D

POWER transmitted along slipping, inefficient drives rapidly becomes wasteful —causes undue expense and decreases machine capacity.

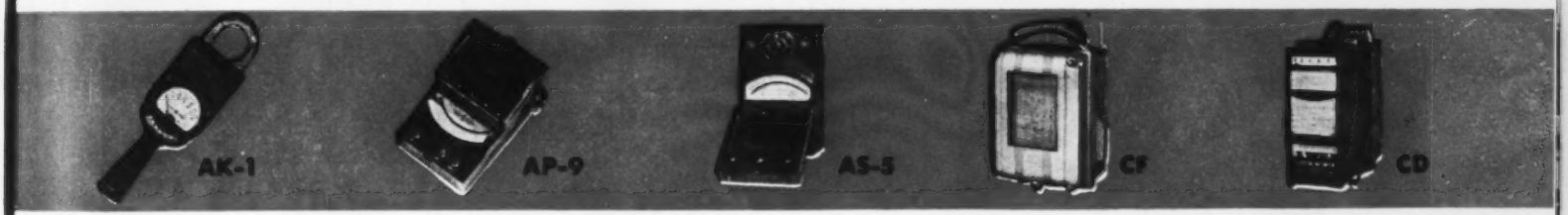
With the Morse Chain Drive principle—"Teeth Not Tension"—there is no chance for slip or power waste. All the power is turned into productive war action at practically 100% efficiency. Every Morse Drive is a completely engineered power transmission unit so selected and designed as to render unfailing service in the severest of conditions. There is no need for constant adjustment, inspection—Morse Drives operate for years requiring hardly any maintenance. To keep war production at maximum, specify Morse Chain Drives—your local Morse Drive Engineer will assist you.

SILENT CHAINS ROLLER CHAINS FLEXIBLE COUPLINGS CLUTCHES

MORSE *positive* DRIVES

MORSE CHAIN COMPANY ITHACA N. Y. DIVISION BORG-WARNER CORP.

Which OF THESE HANDY INSTRUMENTS DO YOU LACK?



Type AK-1 Hook-on Volt-ammeter (A-C) Here's the handiest type of instrument for quick load checks. Forget about cutting conductors or interrupting service. Just hook it around the line, flick the selector switch to AMPERES, and you have your measurement. It measures volts also—connect the voltage leads, snap the switch to VOLTS, and take your reading. Accuracy, ±3 per cent. (Bulletin GEA-2950.)

Type AP-9, Medium-size A-C Portables—and Type DP-9, D-C You'll want this instrument for jobs requiring a high degree of accuracy—it's accurate within ¾ of one per cent. It is very portable—size only 2½ by 6½ by 4¾ inches. Available in a-c ammeters, voltmeters, milliammeters, and wattmeters; and d-c ammeters, voltmeters, milliammeters, microammeters, and millivoltmeters. (Bulletin GEA-1784.)

Type AS-5, Pocket-size A-C Portables—and Type DS-5, D-C This one fits easily in a coat pocket (size, 2 by 3½ by 5½ inches), yet it is accurate within one per cent. Available in a-c ammeters voltmeters, and milliammeters; and d-c ammeters, voltmeters, milliammeters, microammeters, and millivoltmeters. (Bulletin GEA-1784.)

Type CF, Inkless Recorders (Portable) Often, a chart record of load or voltage conditions over a period of time is needed to study the duration of peaks and the time when they occur. The CF line is ideal for this purpose. They're *inkless*—ready to go at a moment's notice—no pen to start, no inkwell to fill, and no ink to spill and blur the record. They weigh only 12 pounds. They are very accurate—a-c voltmeters, within 1½ per cent; ammeters, within 2 per cent. Available in a-c ammeters and voltmeters; and d-c ammeters, voltmeters, milliammeters, microammeters, and millivoltmeters. (Bulletin GEA-3187.)

New Low Chart Speed You can now get a 30-day record on a 30-inch chart—with our new one-inch-per-day chart speed. This simplifies survey analysis. Speeds of 1, 2, and 3 inches per hour can be obtained for applications requiring a higher chart speed.

Type CD, Ink Recorders (Portable and Switchboard Types) These recorders are ideal for those applications where a high degree of accuracy is very important. Either ink type or inkless. They are available in a-c ammeters, voltmeters, wattmeters, power-factor meters, and frequency meters; and in d-c ammeters, voltmeters, milliammeters, millivoltmeters, and wattmeters. (Bulletin GEA-1061.)

Current-measuring Sets (A-C) Any of the above ammeters can be supplied equipped with a split-core current transformer—the AK-1 has the transformer built in. Thus you can obtain the "hook-on" advantages in these other instruments, too, for load measurements.

These are but a few of the many instruments General Electric can furnish to measure any electrical quantity. If you want information about other instruments, we'll be glad to supply it. Ask the nearest G-E office, or write to General Electric Company, Schenectady, N. Y.

The Navy "E", for Excellence, has been awarded to 92,780 General Electric employees in six plants manufacturing naval equipment.

HEADQUARTERS FOR ELECTRICAL MEASUREMENT

WeldELLS

WeldELLS have everything—

No other fittings for pipe welding combine the features found in WeldELL. In addition to that described, they include:

▶ **Seamless**—greater strength and uniformity.

▶ **Tangents**—keep weld away from zone of highest stress—simplify lining up.

▶ **Precision quarter-marked end**—simplify layout and help insure accuracy.

▶ **Permanent and complete identification marking**—saves time and eliminates errors in shop and field.

▶ **Wall thickness never less than specification minimum**—assures full strength and long life.

▶ **Machine tool beveled ends**—provides best welding surface and accurate bevel and land.

▶ **The most complete line of Welding Fittings and Forged Steel Flanges in the world**—insures complete service and undivided responsibility.

It's the difference between RIGHT and WRONG —*this "selective" reinforcement*

BOTH mathematical calculations and practical tests* prove that the bursting stresses in an elbow are greatest at the crotch or inner wall. That's why a special process is employed in producing WeldELLS which provides extra metal in this region of greatest stress as pointed out above. It is the nearest possible approach to the "One Hoss Shay" ideal of absolutely uniform strength throughout.

And it's also one more example of the length to which we have gone in producing WeldELLS to follow sound engineering considerations—considerations which mark the difference between right and nearly right.

An extra value, this—and opposite are listed other extra-value features that are combined in no other fittings for pipe welding. Yet: WeldELLS cost no more!

TAYLOR FORGE & PIPE WORKS, General Offices & Works: Chicago, P. O. Box 485
New York Office: 50 Church Street • Philadelphia Office: Broad Street Station Bldg.

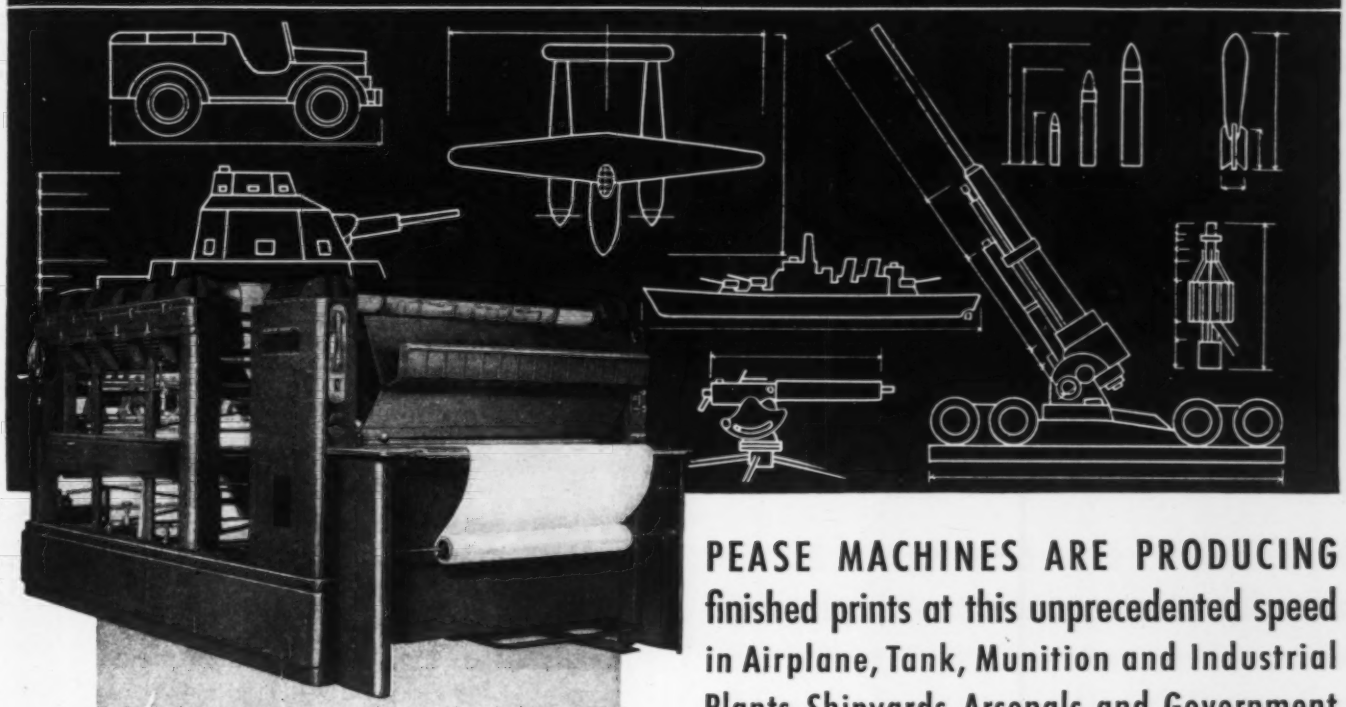
* The amount by which stress is greater at the crotch in a fitting having uniform wall thickness depends only on its radius. Mathematical analysis (specifically the Lorenz formula) shows the stress at the crotch to be:

$$S = \frac{pr\,(2R - r)}{2t\,(R - r)}$$

Where S = Bursting stress, lbs. per sq. in.
p = Internal pressure, lbs. per sq. in.
r = ½ inside diameter of fitting (O.D. if Barlow's formula is desired).
t = Wall thickness in inches.
R = Center line radius of fitting, inches.

Numerous tests by the Research Division of Taylor Forge show the formula given above to be somewhat on the conservative side.

BLUEPRINTS AT 30 FEET PER MINUTE ARE HELPING TO BEAT THE AXIS



PEASE MACHINES ARE PRODUCING finished prints at this unprecedented speed in Airplane, Tank, Munition and Industrial Plants, Shipyards, Arsenals and Government Departments throughout the Nation

The number of Blueprints needed to beat the Axis simply staggers the imagination, for industrial plants and government departments need hundreds upon hundreds for shells, bombs, machine guns and anti-aircraft guns . . . thousands upon thousands for planes, tanks and jeeps . . . tons upon tons for battleships, carriers, transports and cruisers . . . for example, a recent tank improvement required almost 1000 pounds of Blueprints.

Blueprints have the all-important job of speeding the engineers' plans, details and specifications to the production lines, and Pease Model "22" Continuous Blueprinting Machines, with a practical production speed of 30 feet per minute, are helping America exceed its stepped up production program. They operate faster, more economically and require less attention, making sharper, clearer, more contrasty prints from pencil or ink tracings.

Write for complete information.

PEASE MODEL "22" FEATURES
Speed Blueprint Production

- ★ **Sliding "Vacuum-Like" Contact smooths out wrinkles, prevents errors.**
- ★ **Three Speed Lamp Control provides operation at 10, 15 or 20 amperes, does away with running speed and dryer heat changes.**
- ★ **Actinic "No-break" Arc Lamps burn for 45 minutes without breaking arc, resume instantaneously.**
- ★ **Horizontal Water Wash floats prints free from tension and prevents wrinkles, stains, bleeding.**
- ★ **Chemical Applicator System very economically allows change from Blueprints to Negatives in 30 seconds.**
- ★ **Rapid Drying Drums, heated either by gas or electricity, are thermostatically controlled.**

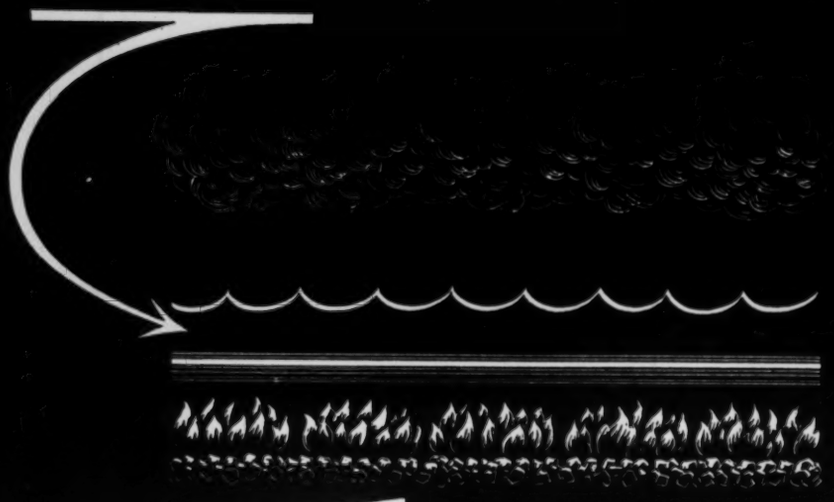
THE C. F. PEASE COMPANY

2623 WEST IRVING PARK ROAD • CHICAGO

Pease Blueprinting Machines

A TYPE AND SIZE FOR EVERY REQUIREMENT INCLUDING DIRECT PROCESS PRINTING

Forcing your boilers? Be sure heat-transfer surfaces are clean!



THE heat-transfer surface—that's where fuel is wasted by "misplaced insulation" caused by improperly treated feedwater. That's where metal is overheated, where it weakens, fails and causes boiler shutdowns.

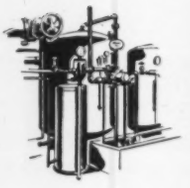
You can't afford to take chances in these days of critical materials and forced production. That's where Permutit* can help. Below are shown some accepted methods of boiler feedwater conditioning that are helping thousands of plants. They can help you. Let us discuss your operating problems with you. Just drop a line to The Permutit Company, Dept. A3, 330 West 42nd St., New York, N.Y.

In Canada: Permutit Company of Canada, Ltd. . . Montreal . . Toronto . . Winnipeg . . Calgary.

*Trademark Reg. U. S. Pat. Off.

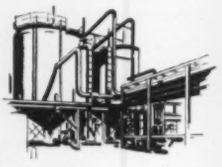
PERMUTIT

WATER CONDITIONING HEADQUARTERS



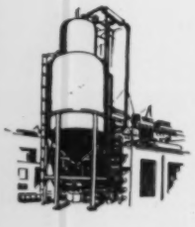
ZEO-KARB* H

The new Permutit Zeo-Karb H water softener removes both hardness and bicarbonates from the raw water. The effluent is soft and reduced in total solids and alkalinity. The sulphate-carbonate ratio may be adjusted as desired by blending.



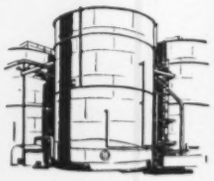
HOT LIME SODA

Lime and soda ash in correct proportions, precipitate the bulk of the hardness as calcium carbonate and magnesium hydroxide. The sludge that is formed is settled out in the settling tank after which the water is filtered. Integral deaerator simultaneously removes the oxygen.



DEAERATING HEATER

The new Permutit Deaerating Heater, utilizing exhaust or bled steam, is guaranteed to remove all oxygen and free CO_2. It is designed for pressures up to 100 pounds or higher. Capacities from 12,500 to 1,400,000 pounds per hour are in service.



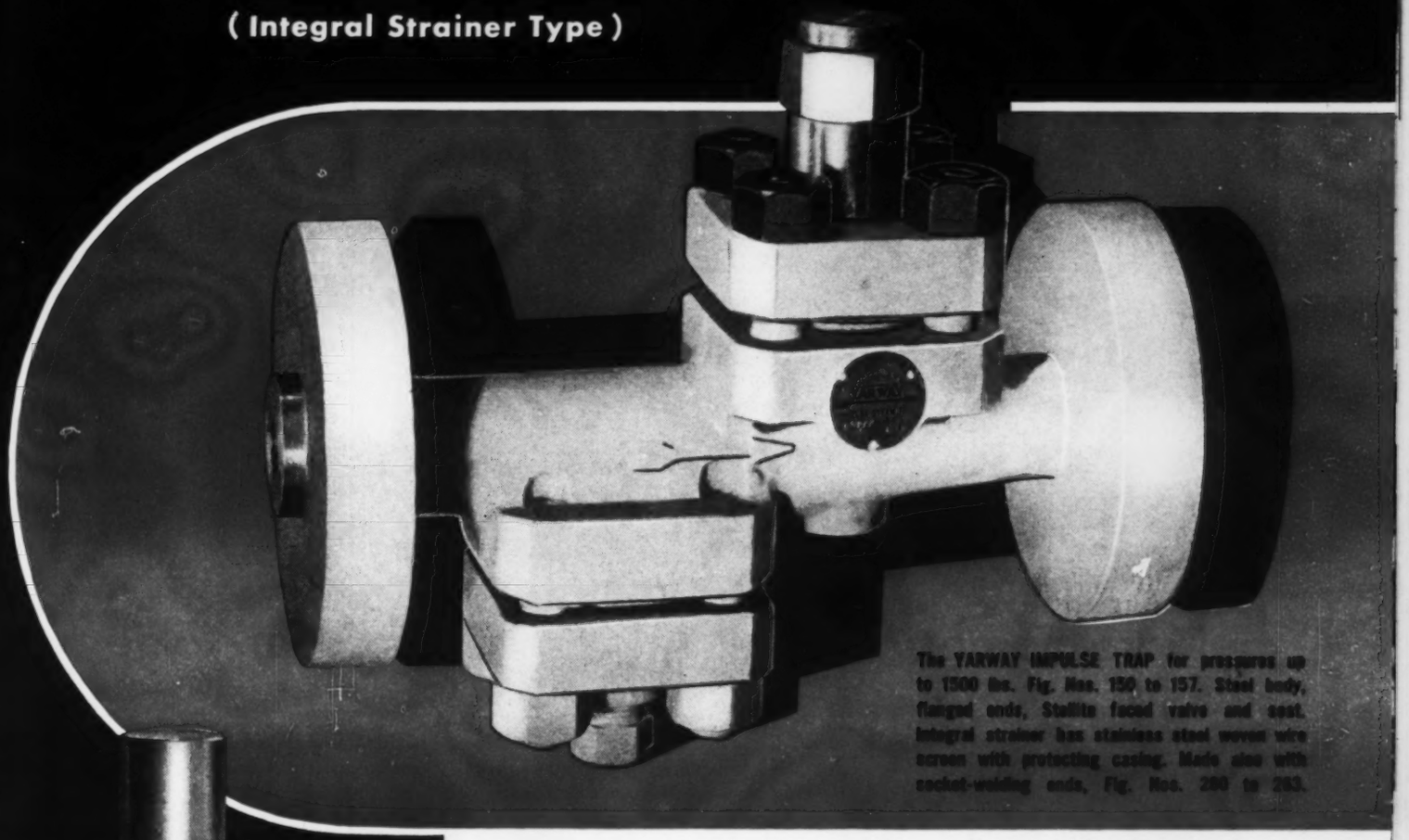
SILICA REMOVAL

Permutit's new process is adaptable to Hot or Cold Lime Soda treatment, and can be applied to existing equipment. It reduces silica content to any degree desired . . . eliminates scale and deposits. The reagents used are low in cost and do not add soluble by-products.

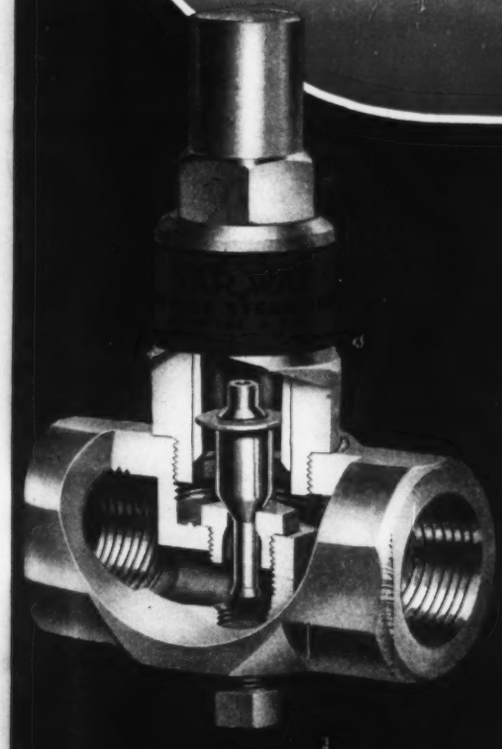
Yarway Impulse Traps

For Pressures Up to 1500 lbs

(Integral Strainer Type)



The YARWAY IMPULSE TRAP for pressures up to 1500 lbs. Fig. Nos. 150 to 157. Steel body, flanged ends, Stellite faced valve and seat. Integral strainer has stainless steel woven wire screen with protecting casing. Made also with socket-welding ends, Fig. Nos. 260 to 263.



The Standard Yarway Impulse Trap. Note only one moving part — a little valve.

ALONG with the remarkable success of the YARWAY IMPULSE TRAP for standard trapping service (more than 180,000 have been purchased), has come its use in steam plants where pressures as high as 1500 lbs and temperatures as great as 900°F are encountered.

The integral strainer trap shown above, developed for this service is suitable for every drainage requirement in high pressure steam installations. It has ample condensate capacity when system is being "warmed up". It will handle relatively small amounts of high temperature condensate, efficiently, without losing its prime.

The valve closes positively in the presence of dry or superheated steam.

It is a fraction of the size and weight of other type traps designed for the same service—saving space, simplifying installation and requiring no support.

It is suitable for all pressures within a wide range without change of valve or seat.

It has the same simplicity of design as does the standard Impulse Trap—only one moving part, a little valve.

Its integral strainer protects the trap against scale and rust in the system.

Made in cast steel with flanged or socket-welding ends, in three classes—for pressures up to 300 lbs, 600 lbs and 1500 lbs.

For complete description of operating principle, send for Bulletin T-1737.

YARNALL-WARING COMPANY, 108 MERMAID AVE., PHILADELPHIA

YARWAY IMPULSE STEAM TRAP

More bombs for Berlin . . . more terror for Tokio

IN TOTAL WARFARE, every pound of metal we can save means just so much added destruction we can hurl at the enemy.

7000 tons of steel saved means approximately 70,000 more heavy bombs to drop on Berlin and Tokio.

2500 tons of copper saved means nearly 1,000,000 additional 3 in. A. A. cartridge cases for blasting Zeros and Messerschmitts out of the sky.

Westinghouse will save these huge amounts of steel and copper during 1942 in its Transformer Plant alone . . . because of *radical improvements in transformer materials and design* that have come out of the Westinghouse Research Laboratories and Westinghouse engineering:

An entirely new kind of transformer steel wherein the crystals line up like tenpins in a row, instead of in helter-skelter fashion as in ordinary silicon steel. This new grain-oriented steel . . . called Hipersil . . . is the result of nine years of intensive study and experiment by Westinghouse Research Engineers.

Hipersil has *one third* more flux-carrying capacity than the best grade of ordinary silicon steel. Because of its higher permeability, less Hipersil core material is needed. Transformer weight may be reduced *25 to 30 per cent*. Hipersil, alone, will save thousands of tons of critical steel and copper in the vast number of transformers Westinghouse will make during 1942.

Forced oil-cooled transformers in which the cooling medium is rapidly circulated inside the transformer shell. This means quicker heat removal. Smaller cores and coils can do a bigger job. Strategic steel and copper are saved to help win the war.

Copper temperature control. Here a liquid-cooled transformer carries a load up to the point where the copper reaches a critical temperature, beyond which the insulation may be damaged. By the use of this thermal control, higher safe loads can be carried. A transformer of a given size, therefore, does *more work* . . . another way of saving steel and copper for more shells and tanks and ships to hurl at the Axis.

Better transformers go hand in hand with these major achievements of Westinghouse "know how" in saving strategic materials for our all-out drive to victory.

Westinghouse Electric & Manufacturing Company, Pittsburgh, Pennsylvania. Plants in 25 cities. Offices everywhere.

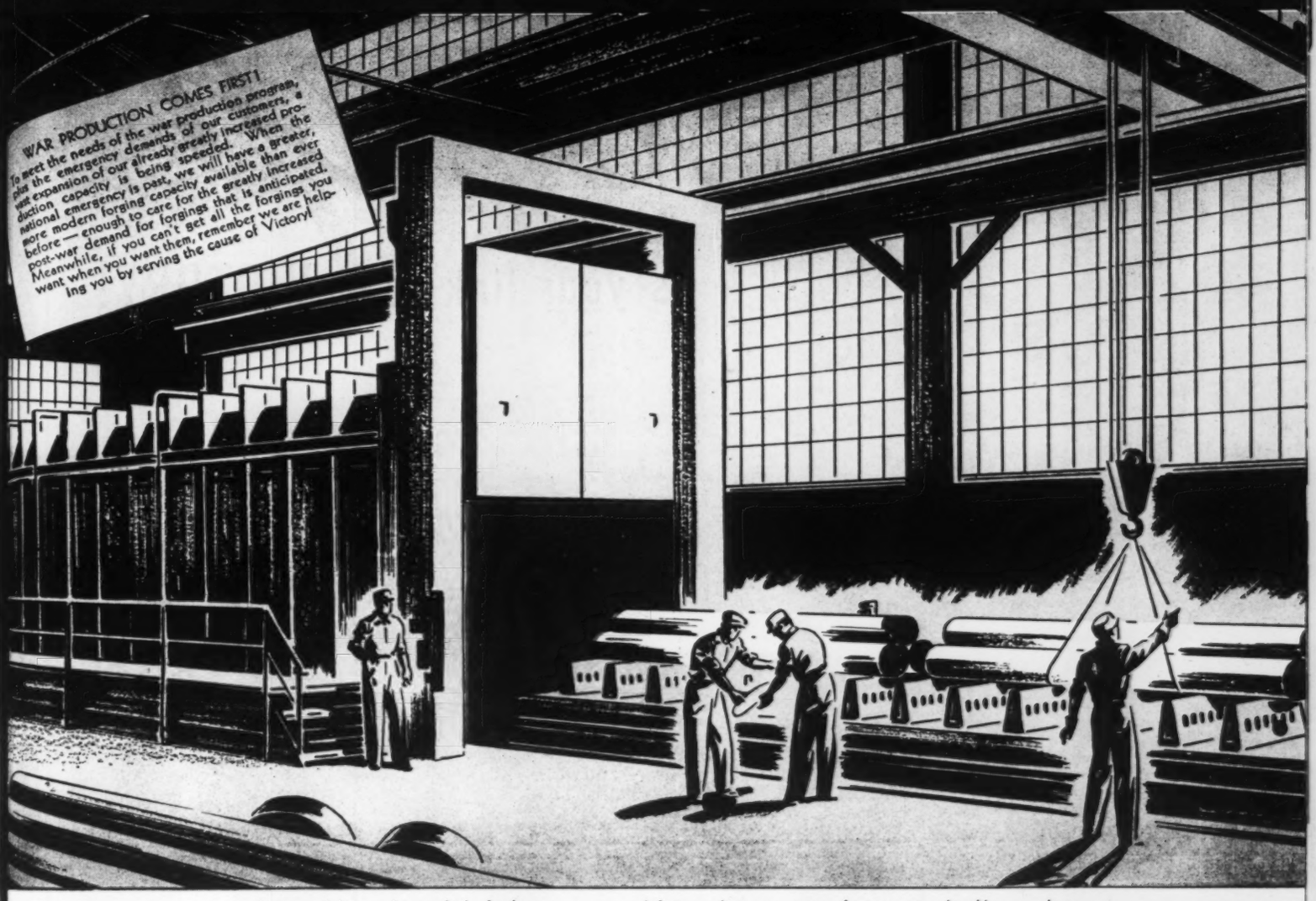
You are cordially invited

to visit the Westinghouse Electrical Exhibit at the Annual Convention of the American Association for the Advancement of Science . . . December 28-31st . . . at the Commodore Hotel, New York.

Westinghouse

. . . making Electricity work for Victory

More and On Time!



A car of large forged shafts being removed from a heat treating furnace in the Kropp shops

...udly we fly the Army and Navy "E" flag and star, ...arded and re-awarded for excellence and proficiency in the production of war materiel.

That's the answer at Kropp Forge to the question of how to meet the country's war demands for forgings. With forgings needed in unprecedented quantities, it did look for a while that it might be "too little, too late" in this definitely vital matter. But Kropp set a pace for the forging industry. "*More and On Time*" was the slogan. More men, more equipment, more shifts, more hours of work added up to more forgings, delivered on time.

Today, with our production multiplied many times, we're serving hundreds of armament builders with forged parts for planes, tanks, ordnance, ships and machine tools. The spirit of the Kropp organization, concentrated wholeheartedly on war production, is evidenced by our constantly increasing tonnage of parts for America's war machine.

Kropp service to war industry includes engineering and design suggestions to reduce weight, cut piece costs, save machining time and increase final production. We have aided many users of forgings in substituting available and adequate steels for hard-to-get alloys, working out heat treating cycles to insure the desired results.

If you manufacture armament parts or essential machines that need drop, upset or hammer forgings, Kropp sales engineers will be glad to serve you.

KROPP FORGE COMPANY

Makers of Drop, Upset and Hammer Forgings for Ships, Guns, Planes, Tanks, Ordnance and Machine Tools

"World's Largest Job Forging Shop"

5301 W. ROOSEVELT ROAD, CHICAGO, ILL.

Representatives in Principal Cities

KROPP

SEGREGATED *Scrap...* is your link to VICTORY!

Scrap salvage is a vital factor in the war effort. To be fully effective a scrap program must include methods for segregating and conserving critical alloying elements so urgently needed in the construction of tanks, guns, ships and planes.

Ferrous and non-ferrous metal scrap should be collected in separate containers at the machine where they are generated. Each class of high-speed tool steel and each type of constructional alloy steel should likewise be kept separate so that the alloy content can be returned to service.

Remember, — alloy scrap which is segregated, classified and labeled according to type and composition is a vitally important commodity today—and urgently needed to augment primary supplies of Nickel, molybdenum, tungsten, etc.

The metallurgical experience of our technical staff is available to aid you in these and other phases of metal salvage.

KEEP SCRAP MOVING INTO WAR PRODUCTION!

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK, N. Y.

PISTOLS PILL BOXES and PIG BOATS

begin with **WINNER Techno-TONE DRAWING PENCILS**

First it was an idea—nebulous as air.

Next a rough pencil sketch.

Then a ton of drawings, renderings and blueprints.

Finally, a gleaming behemoth of steel slugging it out with the enemy.

Multiply this by infinity and you get an approximate idea of the pencil work that goes into Uncle Sam's War Production.

That WINNER Techno-TONE Drawing Pencil has been an indispensable factor in much of this work is an established fact. Established, too, is the preference of Craftsmen for this precision-milled pencil . . . for its grit-free smoothness, its flakeless, smudgeless rich black uniformity of tone. You are welcome to try a free sample. Just tell us the degree you prefer.

Write Dept. ME-12, A. W. Faber, Inc., Newark, N. J.

★

Companion Pencil—WINNER Thin Colored Checking—Superb colors and strength. Choicest for all prints: 2381 Red; 2382 Blue; 2383 Green; 2385D Yellow; 2437D Orange. 10¢ each. $1.00 dozen. Would you like a sample?

★

WINNER Techno - TONE is available in 17 scientifically graded tones — 6B to 9H. Polished rich green. Packed in metal box. Made in U.S.A.

A·W· FABER Inc. NEWARK, N. J.

13c each 2 for 25c $1.25 dozen

AT ALL DRAWING AND ARTISTS MATERIAL DEALERS AND LEADING STATIONERS

Slow downs may mean . . . "Bare Hands vs. Bayonets"

IT TAKES MORE than courage alone for soldiers to win battles today.

It takes specialized fighting equipment . . . as much as our vast industries can produce, working every last hour on the clock. For we are sending millions of men against a mechanized foe, and our men must have fighting tools to stand a fighting chance. Nowadays, a *poorly* equipped soldier would stand little more chance than a man with bare hands against bayonets.

And so time . . . production time . . . has become the most vital element in the war right now. We simply cannot afford to sabotage war effort by allowing a slow down where that slow down can be prevented.

There is one type of industrial slow down that *can* be prevented . . . the interruption caused by failure of the valves that control vital power and production fluids in your plant. The way to prevent this type of slow down is to *avoid valve trouble before it starts!*

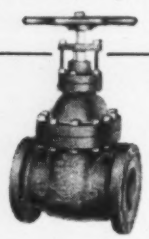
Keep your valves operating efficiently, *continuously*, by inspecting them *regularly*. Renew worn parts before they cause destruction of the whole valve. And when valves must be replaced, have the new valves selected by experts, installed by experienced men. Above all, train *new* workers to operate and maintain valves properly.

Jenkins Engineers are ready to assist any management in developing a practical program of valve conservation.

Army-Navy "E" Pennant, awarded to Jenkins Bros. for high achievement in the production of war equipment.

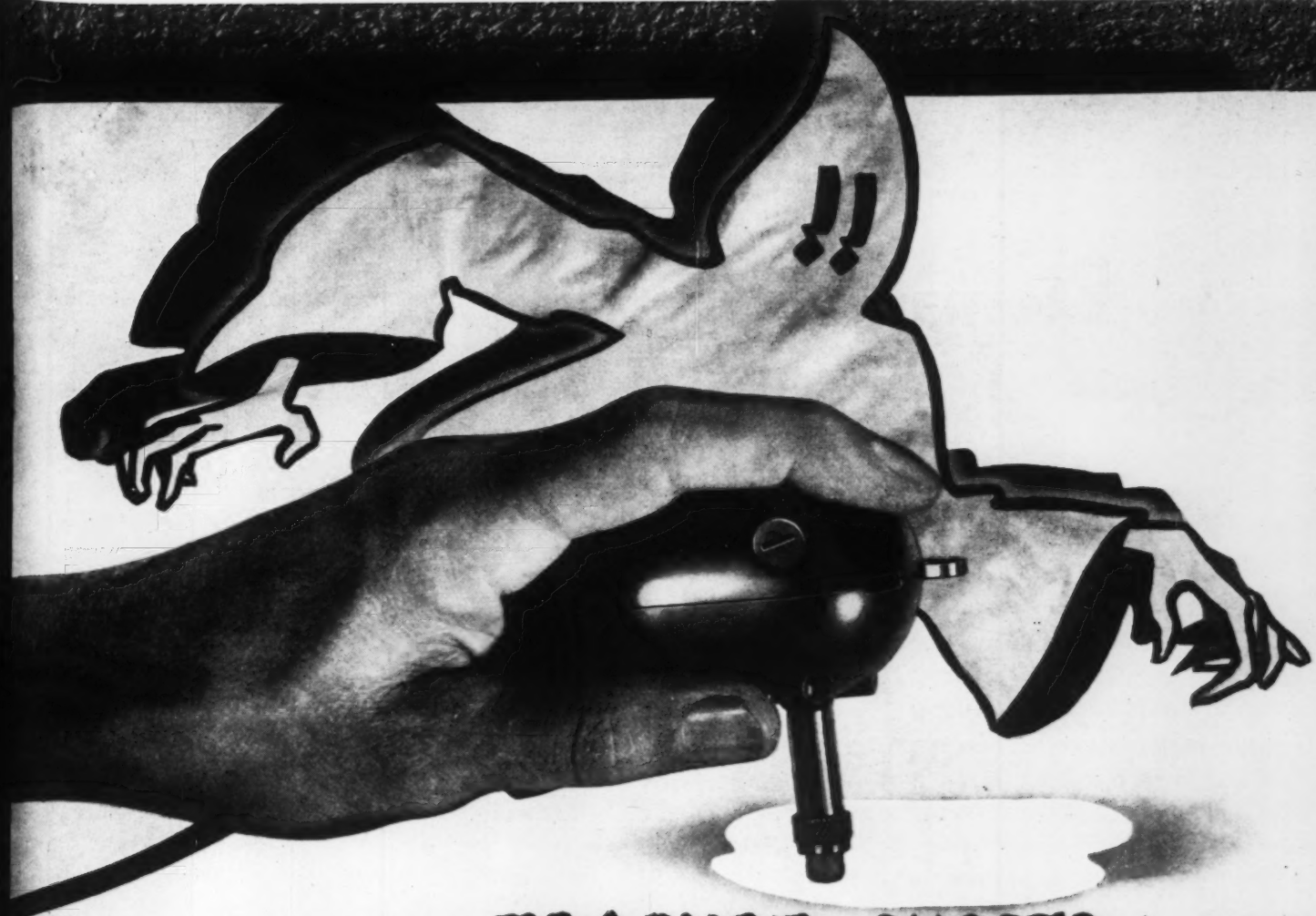
Jenkins Bros., 80 White Street, New York, Bridgeport, Atlanta, Boston, Philadelphia, Chicago. Jenkins Bros., Limited, Montreal, Canada; London, England.

Reprints of this advertisement are available for use in morale-building work.



JENKINS VALVES

For every industrial, engineering, marine and power plant service . . . in Bronze, Iron, Cast Steel and Corrosion-Resisting Alloys . . . 125 to 600 lbs. pressure.



DEFY ERASURE-GHOSTS
with this new tracing cloth

Here is a tracing cloth that holds erasure scars at a minimum—that won't show water marks or perspiration stains. Now you can have clean tracings, in pencil or ink, free from these untidy "ghosts" that reproduce on blueprints!

For PHOENIX is ghost-proofed by a remarkable new process that defies moisture and gives you an unusually durable working surface. You can use harder pencils with this improved cloth and get sharper lines with less tendency to smudge. Even 6H lines show clearly, and reproduce sharply! Erasing does not mar the drawing surface; erased areas take pencil smoothly—and ink without feathering. Its new white color and increased transparency give you excellent drawing contrast and produce strong blueprints.

Let PHOENIX prove its virtues on your own drawing board. See your K&E dealer, or write for a generous working sample and an illustrated brochure.

EST. 1867

KEUFFEL & ESSER CO.

NEW YORK · HOBOKEN, N. J.

CHICAGO · ST. LOUIS · SAN FRANCISCO · LOS ANGELES · DETROIT · MONTREAL

PHOENIX DEFIES MOISTURE GHOSTS

Perspiration and water splashes on ordinary tracing cloth create "ghosts" which reproduce on blueprints. PHOENIX Tracing Cloth withstands actual immersion in water for fully 10 minutes at a time! *Perspiration and water marks will not stain it!*

PHOENIX LESSENS SMUDGE GHOSTS

The new improved surface of PHOENIX Tracing Cloth permits you to use harder pencils (5H and 6H) and to get sharper lines with less tendency to smudge.

Result: Cleaner tracings and blueprints.

PHOENIX REDUCES ERASURE GHOSTS

Ordinary tracing cloths become scarred when erased... erased spots produce ghosts on blueprints.

PHOENIX has a durable drawing surface that reduces working scars to a minimum.

K&E

Phoenix

REG. U.S. PAT. OFF.

TRACING CLOTH

for pencil *and* ink

Eternal Vigilance is also the Price of PROGRESS

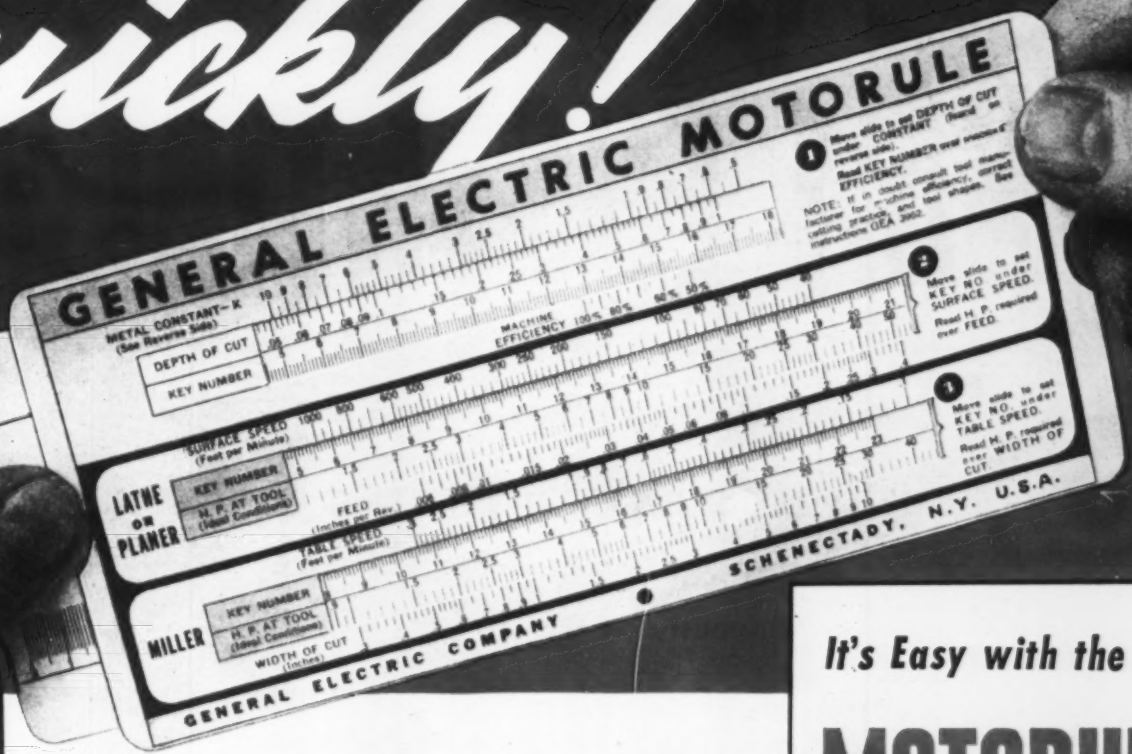
VIGILANCE . . that looks ahead and plans ahead and works ahead . is the only assurance and insurance that things will continue to go all right.

That assurance, and insurance, cover the most territory at the least cost when what YOU do, to serve industry and the Nation, is made articulate where looking ahead and working ahead never *waver.*

Looking ahead, planning ahead and working ahead constitute the unwavering purpose of MECHANICAL ENGINEERING and the 63-year old service it represents.

The cumulative values enjoyed by manufacturers whose industrial equipment and engineering materials are publicized in MECHANICAL ENGINEERING are the result of 63 years of continuity . . in forward-looking, cooperative endeavor.

FIND METAL-CUTTING HORSEPOWER Quickly!



It's Easy with the G-E MOTORULE*

First you refer to a convenient table of constants, printed on each rule, choosing the constant for the particular type of metal to be cut. Then by setting the scales to the known cutting speed, feed, and cut, you arrive at the cutting power required on the basis of ideal tool and machine conditions. Complete instructions are furnished with each MOTORULE.

*The MOTORULE is not intended to supplant the instructions of machine builders as to the power requirements of their machines. It is offered to fill the gap when these recommendations are unavailable.

This newly developed load calculator makes it easy to figure the motor horsepower required for metal-cutting operations when the recommendations of the machine builder are unavailable. Its advantages? You can avoid *undermotoring* and save yourself production delays; you can avoid *overmotoring* and save the nation vitally needed steel, copper, and aluminum.

The G-E MOTORULE is accurate for a wide variety of cutting operations on lathes, drills, milling machines, and planers. It works on a wide range of materials, because you start from a convenient table of constants for the material being cut.

The results of many years of work by metal-cutting authorities were used by G-E engineers as a basis for the MOTORULE. The formulas were checked against actual load tests, and leading machine-tool builders were consulted.

The MOTORULE will help you in making sure of adequate motor capacity on machines being put to new war work, and in selecting motors for machines formerly driven from line shafting. To get your MOTORULE, just get in touch with your G-E Motor Representative. Or, if you wish, mail the coupon direct to General Electric, Schenectady, N. Y.

SPECIFY TRI-CLAD MOTORS

REG. U.S. PAT. OFF.

Standard G-E Motors Are Generally Available without Delay for War Jobs

General Electric Co., Sec. 750-159A, Schenectady, N. Y.

- ☐ Please send your MOTOR FITNESS MANUAL, GED-1017.
- ☐ Please send me a G-E MOTORULE, with full instructions and leaflet giving the principles on which it is based.

Name.....

Title.....

Company.....

Street.....

The Navy "E", for Excellence, has been awarded to 92,780 General Electric employees in six plants manufacturing naval equipment.

GENERAL ELECTRIC

WHAT IS MACHINERY'S No. 1 ESSENTIAL?

. . IT'S LUBRICATION OF THE RIGHT KIND that will keep production machines in good operating condition and continuously on the job. Idle machines due to worn bearings, gears or chains, caused by improper lubrications are certainly on the blacklist these days . . . and remember that machine replacement parts are most difficult to get. Yes—the No. 1 essential today is proper lubrication.

★ ★

7 QUICK FACTS ABOUT LUBRIPLATE LUBRICANTS

1. *LUBRIPLATE produces an ultra-smooth, wear-resisting bearing surface.*
2. *LUBRIPLATE reduces friction, thus lowering maintenance and power costs.*
3. *LUBRIPLATE resists rust, corrosion and pitting.*
4. *Most LUBRIPLATE products are white. LUBRIPLATE assures clean lubrication.*
5. *LUBRIPLATE outlasts ordinary lubricants many times.*
6. *LUBRIPLATE is economical—a little goes a long way.*
7. *LUBRIPLATE is available in fluid and grease types for every need.*

LUBRIPLATE DIVISION
FISKE BROTHERS REFINING COMPANY
SINCE 1870
Newark, N. J. Toledo, Ohio
DEALERS FROM COAST TO COAST

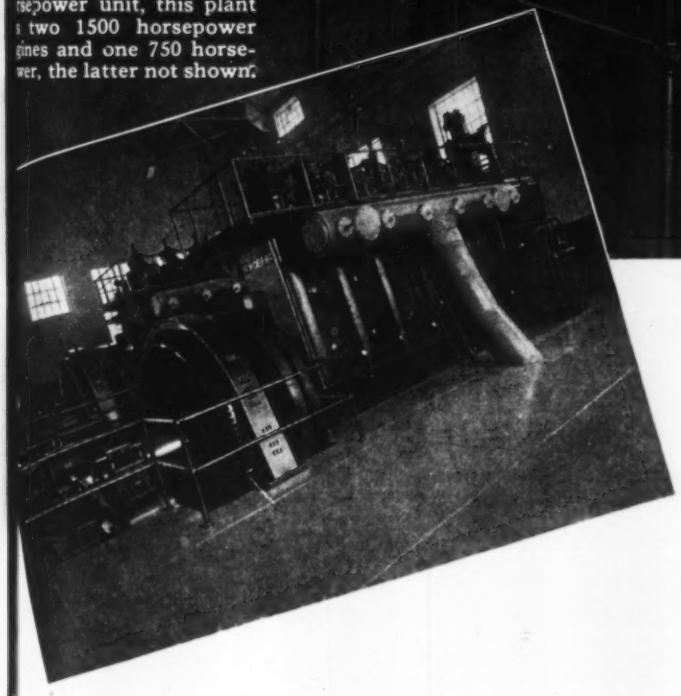
LUBRIPLATE
THE MODERN LUBRICANT *that Arrests Progressive wear*
"Its the Film"

4 UNITS-

A THIRD REPEAT ORDER

All burn natural gas

tash Company of America
Carlsbad, New Mexico
addition to this new 2400
rsepower unit, this plant
s two 1500 horsepower
gines and one 750 horse-
wer, the latter not shown.



With the fourth Nordberg Diesel Engine in service at the Carlsbad, New Mexico plant of Potash Company of America, this makes the third repeat order this company has placed with Nordberg in four years. Here is another satisfied Nordberg customer and evidence of the satisfactory performance given by these four engines totalling 6150 horsepower. The first three units were originally arranged to burn fuel oil but have since been changed to burn natural gas. With the Nordberg Dual Fuel Burning Engine it is possible to change quickly from one fuel to the other without change of any major engine parts. Where natural gas is available this engine offers outstanding advantages. It is the most efficient gas burning engine available today. Write for Bulletin 106.

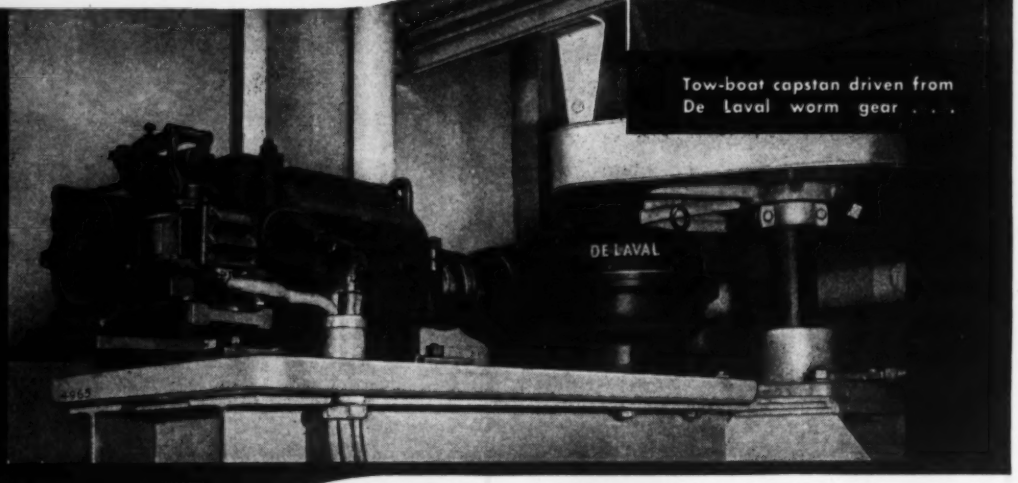
NORDBERG MFG. CO. · MILWAUKEE

We are proud to serve our country and to have been awarded the Navy "E" for EXCELLENCE in production.

NORDBERG
DIESEL ENGINES

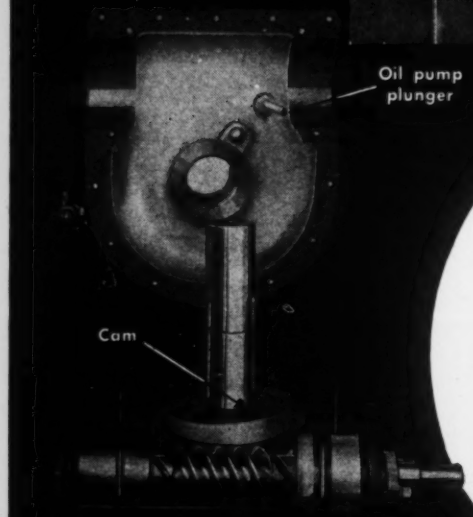
DE LAVAL WORM GEARS *require little attention*

Tow-boat capstan driven from De Laval worm gear . . .



Motor drive through De Laval vertical drive worm gear and spur gear to capstan.

Vertical drive worm gear with cover lifted.



The two working parts are enclosed in a moisture-and dust-proof housing and run in a bath of oil. Where splash lubrication is not dependable, an oil pump is provided, as for the upper bearing of the vertical shaft drive here shown. No attention is required other than to check the oil level at long intervals.

Power is transmitted by a continuous, shockless, wedging action, with contact at all times between three or more pairs of teeth, which are subject to compression rather than bending.

The case-hardened steel worm, the wheel of bearing bronze and copious lubrication insure high efficiency, long life and unequalled reliability.

Describe requirements and ask for Publication W-1137.

DE LAVAL WORM GEAR DIVISION

of the De Laval Steam Turbine Co., Trenton, N. J.

MANUFACTURERS OF TURBINES STEAM, HYDRAULIC PUMPS CENTRIFUGAL PROPELLER, ROTARY DISPLACEMENT, MOTOR-MOUNTED, MIXED-FLOW, CLOGLESS, SELF-PRIMING CENTRIFUGAL BLOWERS and COMPRESSORS, GEARS WORM, HELICAL and FLEXIBLE COUPLINGS

A.S.M.E. GUIDE

15th National Exposition of Power and Mechanical Engineering

Madison Square Garden, New York, N. Y. November 30th to December 4th, 1942

THIS year the Exposition will be held at Madison Square Garden. Originally scheduled for the Grand Central Palace, the change in location was made necessary when the Army took over the Palace recently as an induction center. It is in the Exhibition Hall of the Garden, which permits all exhibits to be staged on one floor. A special entrance has been provided through a new lobby on 49th Street, just west of Eighth Avenue, giving separate and direct access to the Show at all times.

Recognized for twenty years as a national market for the newest products of research and invention in power and mechanical engineering, the Exposition this year has been organized for the special purpose of contributing to the Nation's War Effort by concentrating at one time and place, equipment, information and mental resources needed to maintain and increase power production and to use it more efficiently.

This "Guide to the National Power Show" contains a list of Exhibitors supplied by the International Exposition Co. who manage the Show. It appears on pages 46 and 48. Its accuracy in detail is not final because of inevitable additions and changes between the date of going to press and the opening of the Show. In this list the numbers of the booths occupied are given and by referring to the floor-space diagram shown on page 44, a user of this Guide can readily locate any booth in which he is interested. The Exposition will be open from Monday, November 30th to Friday, December 4th, inclusive. Opens Monday at 2 P.M. and then daily from 11 A.M. to 10 P.M.; Friday until 6 P.M.

Industry has changed, or is changing to new lines to an extent that staggers the imagination. Beyond comprehension is the transformation of civilian enterprise of military exigence. It is consecrating great new projects to war alone, converting huge plants from civilian producers to adopt new materials and new methods outside the shadow of priorities, allocations and the PRP.

Power is the mainspring of all industrial activity. Mechanical engineering determines its application. The "new approach" which all industry is learning applies power under a new sort of economy which puts volume ahead of cost considerations, which formerly ruled. But high-speed production, held to tight specifications, as war-work is, under good management also cuts costs.

Close observers of the trends, therefore, see revolutionary changes in future manufacturing methods as outgrowths of current experience. Many lessons are being learned that will be put to practical use in turning out more and better products at lower prices when the change-back comes.

Exhibitors at the Exposition this year are co-operating to make displays an important contribution to the war production program, but holding an eye on the future. This is reflected in the attitude of the large group of well-known companies exhibiting, as well as in the material selected for display and the manner in which it is set up.

Such displays cover many features of power production in both large and small plants and include the entire range of apparatus from devices which signal dangerous temperatures in the coal pile, through the power house to pipeline conveyors for ash handling.

In between these extremes are literally hundreds of instruments and appliances for improving the performance of existing plants in the generation and utilization of steam.

As heretofore, the power theme will be very much in evidence at the Exposition. The range of exhibits includes such items as stokers, blowers, fans, cooling equipment, refractories, coal and ash handling equipment, dust collectors, insulation, combustion controls, pumping, piping, tubing, all types of valves, steam traps, steam specialties of many kinds and a variety of power plant supplies.

Machine tools are being driven at top speeds, two or three-shifts, and without resting on the seventh day, and a number of exhibits point to means for keeping producing equipment going under heavy pressure and include a section devoted to machine tools with a number of displays that are of special interest to die and tool makers and contractors requiring light production units.

Exhibits in the tool section include portable electric drills, screw drivers, nut setters, grinders, sanders and polishers; also metal cutting band saws, drill presses and radial cut-off machines, horizontal metal-cutting band saws, millers, shapers, a mill and jig borer, and many others.

Some of the many important classes of exhibits, of which there are many examples at the Show, are those featuring power transmission equipment, materials handling equipment, and equipment for plant up-keep and maintenance.

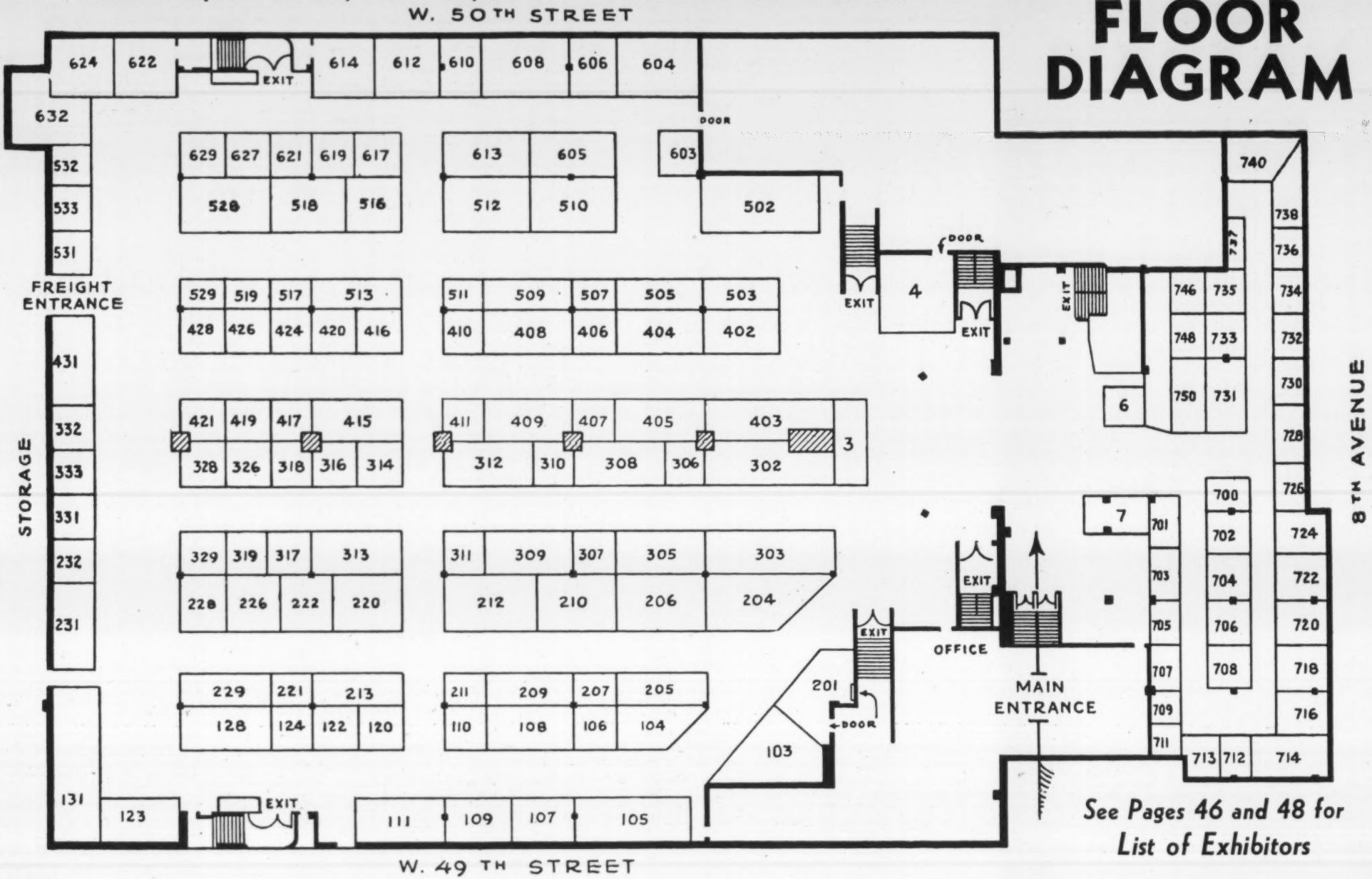
As in previous years, the National Power Show is being held during the same week as the A.S.M.E. Annual Meeting; and a special invitation is extended to all A.S.M.E. members to attend. Tickets of admission can be had without charge at Society Headquarters.

A.S.M.E. members are especially invited to visit the A.S.M.E. Booth (No. 3) on the main floor near front entrance, where information regarding A.S.M.E. activities and publications will be available.

FIFTEENTH NATIONAL EXPOSITION OF POWER AND MECHANICAL ENGINEERING

Madison Square Garden, New York, N. Y. November 30th to December 4th

FLOOR DIAGRAM



See Pages 46 and 48 for List of Exhibitors

Incorporate Lord Shear Type Mountings in your new equipment designs, regardless of type or size, light and delicate or heavy and massive. The advantages to be gained are numerous and the results are permanent. Lord Bonded Rubber Shear Type Mountings isolate vibration, absorb shock and minimize all noise translated through solid conduction. Providing for Lord Mountings in your equipment designs allows you to enjoy many advantages of a far reaching, economic character, resulting in *immediate* lower production costs, as well as lower *ultimate* cost of equipment. Lord Bonded Rubber Mountings are made in two main types, Tube Form and Plate Form, with variations to suit special conditions. No intricate layout, no special tooling or close machining are necessary to accommodate Lord Mountings.

For Plate Form Mountings, simply provide attaching holes and clearance for rubber body. For Tube Form Mountings, provide sockets, solid or clamp type. For Holder Type Mountings, attaching holes only are required. Lord Mountings are made in many standard sizes with load capacities ranging from a few ounces up to 1500 pounds.

Properly installed, Lord Mountings definitely:—

1. *Prolong equipment life* by isolating vibration, which reduces metal fatigue, thereby preventing subsequent failure.

2. *Increase production* by eliminating the necessity for close machining and precision alignment.

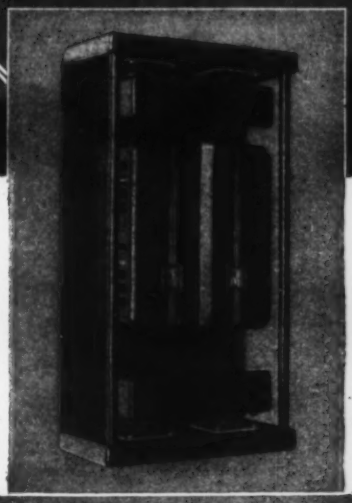
3. *Save vital material* by reducing equipment weight; heavy inertia masses of machinery bases can be eliminated.

4. *Increase personnel efficiency* by eliminating nerve wearing noise and vibration, translated through solid conduction.

5. *Lower maintenance costs* by protecting equipment against sudden load shocks and stresses, thereby minimizing repair and replacement operations.

All of the far reaching effects and favorable results that will be obtained by incorporating Lord Bonded Rubber Mountings in your new equipment designs cannot be listed here. Send for Bulletins 103 and 104 on Lord Shear Type Mountings, or better still, call in a Lord vibration engineer for consultation on your design problems. There is no obligation.

See our exhibit at the National Power and Mechanical Engineering Exposition, Booths 517–519, Madison Square Garden, New York, Nov. 30–Dec. 4.



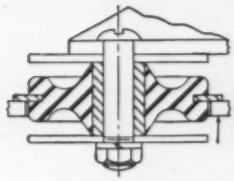
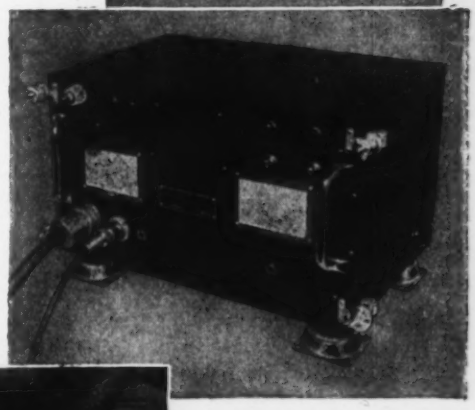
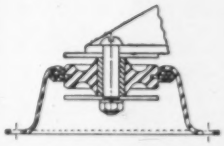
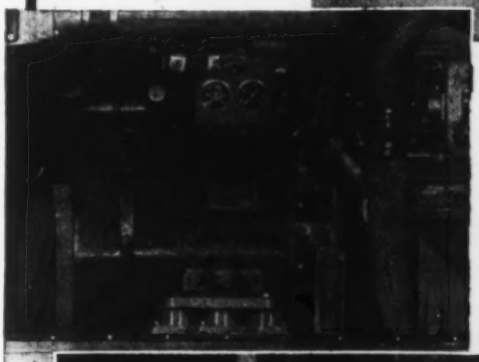


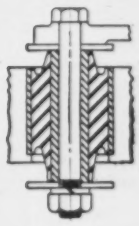
PLATE FORM MOUNTING



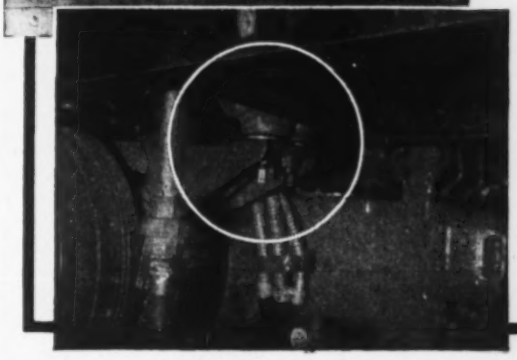


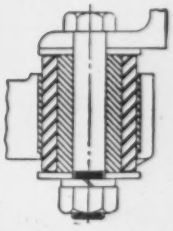
HOLDER TYPE MOUNTING





TUBE FORM MOUNTING





VERTICAL SNUBBING MOUNTING

LORD MANUFACTURING COMPANY . . . ERIE, PA.

LIST *of* EXHIBITORS

See Page 44 for Floor Diagram

Fifteenth National Exposition of Power and Mechanical Engineering

(Corrected to November 20, 1942 from list supplied by International Exposition Co.)

ALPHABETICAL LIST

A

Booth

A.S.M.E. Mechanical Catalog & Directory.....3
29 W. 39th St., New York, N. Y.

American Artisan.....222
6 N. Michigan Ave., Chicago, Ill.

American Brass Co.....131
Waterbury, Conn.

American Car & Foundry Co.....431
30 Church St., New York, N. Y.

American Pulley Co.....313
4200 Wissahickon Ave., Philadelphia, Pa.

American Society of Mechanical Engineers, The.....3
29 W. 39th St., New York, N. Y.

Ampco Metal, (Inc.).....105
1745 S. 38th St., Milwaukee, Wis.

Andmar Co.....221
149 Broadway, New York, N. Y.

Armor-Clad Co.....314
39 Hyatt Ave., Newark, N. J.

Atlas Press Co.....705, 707
Kalamazoo, Mich.

B

Baldwin Belting & Leather Co.....232
85 Chambers St., New York, N. Y.

Baldwin-Hill Co.....111
501 Klagg Ave., Trenton, N. J.

Barrett-Cravens Co.....331, 332, 333
3262 W. 30th St., Chicago, Ill.

Black-Sivalls & Bryson.....416
Kansas City, Mo.

Boston Gear Works.....608, 610
North Quincy, Mass.

Brickseal Refractory Co.....511
1029 Clinton St., Hoboken, N. J.

Bridgeport Brass Co.....528
Bridgeport, Conn.

Brooke Engineering Co.....205
4517 Wayne Ave., Philadelphia, Pa.

Brown Corp., W. R.....740
Chicago, Ill.

Burgess Battery Co.....509
2815 W. Roscoe St., Chicago, Ill.

C

Cambridge Instrument Co.....231
Grand Central Term., New York, N. Y.

Canadian Radium & Uranium Corp.....307
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Clements Manufacturing Co.....700
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Coal Specialties Co.....415
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Gray-Mills Co.....728
213 W. Ontario St., Chicago, Ill.

Grob Bros.....731
Grafton, Wis.

Gulf Oil Corp.....308
3800 Gulf Bldg., Pittsburgh, Pa.

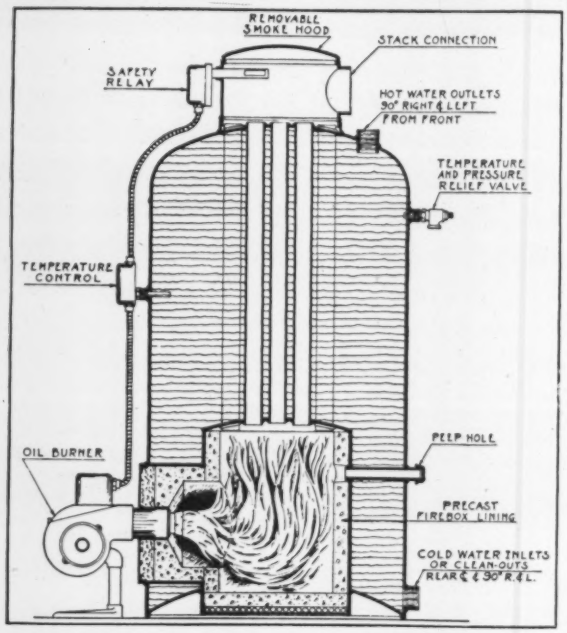
H

Hahn Engrg. Div., Luria Steel & Trading Corp.....613
233 Broadway, New York, N. Y.

Abundant Hot Water for Army Barracks Mess Halls, Hospitals, Hotels, Defense Housing Projects, War Industries

270 g.p.h.
230 gallon
self-storage

The
NEW
Heavy Duty
Water Heater
built by
JOHNSON



AQULUX-225

Here's the answer to a wartime need . . . a fully automatic water heater that delivers 270 gallons per hour . . . that consumes a minimum of fuel . . . that is built with a minimum of critical materials.

It has the famous Johnson Bankheat Burner with 225,000 btu output to insure high recovery and large volume . . . a burner which carries the Underwriters' and Commercial Standard Label for safety and performance.

The 230 gallon tank is not insulated, nor galvanized, nor encased in a steel jacket (except on special order). In these and other ways, the use of essential materials have been cut to a minimum without sacrificing efficiency or safety.

It is built of black steel plates, electric arc welded; extra heavy steel fire-tubes; and precast refractory lined combustion chamber for oil or gas fuel. Temperature and pressure relief and drain valve are standard equipment. It requires little floor space. Installation is simple and inexpensive.

May we send you the complete data on this wartime "big brother" of the widely known Aqulux-85 and 150 models? Or on the still larger, standard Johnson heaters with capacities up to 600 g.p.h. and special units which we can build to your particular specifications? We'll send it gladly.

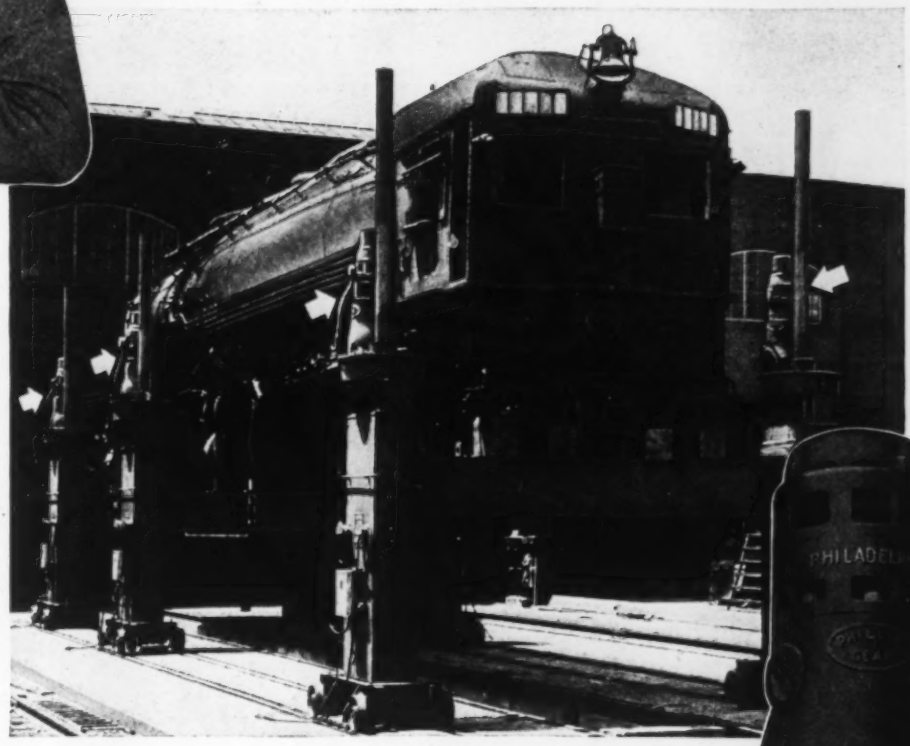
S. T. JOHNSON CO.

40 years experience in the Engineering and Building of Fuel Oil Equipment

940 Arlington Ave.
Oakland, California

401 No. Broad St.
Philadelphia, Pa.

MOTOREDUCERS are helping to keep America's Rolling Stock Rolling



Illustrated is a pitless type locomotive hoist built by Whiting Corp. and installed at the repair shops of one of the country's largest railroads. The total capacity of its six jacks is 460 tons. Each end pair of jacks will lift 130 tons while the center pair will handle 200 tons. On each jack a Philadelphia MotoReduceR supplies the lifting power.

A Vertical Type MotoReduceR

To perform the great wartime job of transporting men and materials which our railroads are doing so ably, locomotives and cars have to be maintained in top working order, yet the time they are out of service for repairs or check-ups must be held to a minimum. Equipment used in repair shops must be dependable and efficient, so for that reason we are justly proud that Philadelphia MotoReduceRs were chosen to operate this huge locomotive hoist.

Philadelphia MotoReduceRs are driving practically all kinds of equipment in industrial plants, operating with high efficiency (up to 97%) and freedom from maintenance troubles. Made in both horizontal and vertical types and in a wide range of ratios and horsepowers they are the ideal answer where a self-contained drive is needed. Write today for more details.

VISIT US AT THE POWER SHOW — BOOTH NO. 516

PHILADELPHIA GEAR WORKS

INDUSTRIAL GEARS AND SPEED REDUCERS LIMITORQUE VALVE CONTROLS

ERIE AVENUE & G STREET PHILADELPHIA, PA.
New York, Pittsburgh, Chicago

***Philadelphia* LIMITORQUE CONTROL** operates all types of valves, etc., safely, economically, from convenient stations.

***Philadelphia* GEARS** All types and sizes of industrial gears. Can be supplied in all materials.

***Philadelphia* WORM GEAR SPEED REDUCER** right angle drives — vertical or horizontal. Wide range of ratios and horsepowers.

***Philadelphia* MOTOREDUCER** The economical self-contained drive, Horizontal or Vertical types — various ratios and horsepowers.

***Philadelphia* HERRINGBONE SPEED REDUCER** for heavy loads at high speed. Single, Double, Triple Reductions, various ratios and horsepowers.

LIST *of* EXHIBITORS

See Page 44 for Floor Diagram

Fifteenth National Exposition of Power and Mechanical Engineering

(Corrected to November 20, 1942 from list supplied by International Exposition Co.)

Booth

Halpern, Wm., Co. 731, 733, 735, 737, 746, 748, 750
53 Park Place, New York, N. Y.

Hartzell Propeller Fan Co. 533
Piqua, Ohio

Heating, Piping & Air Conditioning 222
6 N. Michigan Ave., Chicago, Ill.

Heating & Ventilating 424, 426
148 Lafayette St., New York, N. Y.

Honan-Crane Corp. 409
30 Church St., New York, N. Y.

Hoppes Manufacturing Co. 221
Springfield, Ohio

Hotstream Heater Co. 507
8007 Grand Ave., Cleveland, Ohio

Howe & Son (Inc.) 726
Hinsdale, N. H.

I

Independent Pneumatic Tool Co. 734, 736
600 W. Jackson Blvd., Chicago, Ill.

Industrial Press 424, 426
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Industrial Sheet Metal Works 229
370 Lexington Ave., New York, N. Y.

Industry & Power 318
St. Joseph, Mich.

Insto-Gas Corp. 629
1900 E. Jefferson Ave., Detroit, Mich.

Ironbound Box & Lumber Co. 128
42 Hoffman Pl., Hillside, N. J.

Iron Fireman Manufacturing Co. 502
3170 W. 106th St., Cleveland, Ohio

J

Johns-Manville 512
22 E. 40th St., New York, N. Y.

Visit BOOTH 627
for
Power Plant Specialties

Steelbestos
Trade Mark Reg.
GASKETS
for Stationary Water Tube Boilers

Treated *Steelbestos*
Trade Mark Reg.
GASKETS
for Marine Water Tube Boilers

AUTOMATIC
AIR SEPARATORS
for removing water from compressed air

JOHN R. ROBINSON
Established 1907
POWER PLANT SPECIALTIES
350 West 31st Street
New York, N. Y.

Johnson Manufacturing Corp. 720
Albion, Mich.

Jones, Joseph C. (Inc.) 221
110 E. 42nd St., New York, N. Y.

K

Keeney Publishing Co. 222
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Kent Co. 6
Rome, N. Y.

L

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Lord Manufacturing Co. 517, 519
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Lovejoy Flexible Coupling Co. 211
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Los Angeles, Calif.

Mall Tool Co. 703
7740 S. Chicago Ave., Chicago, Ill.

Marlo Co. 529
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Mechanical Engineering 3
29 W. 39th St., New York, N. Y.

Melrath Supply & Gasket Co. 316
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Metallizing Co. of America 310
5 State St., New York, N. Y.

Mill & Factory 228
205 E. 42nd St., New York, N. Y.

Mill Factor Products Co. 740
53 West Broadway, New York, N. Y.

Millersburg Reamer & Tool Co. 740
Millersburg, Pa.

Morse Magneto Clock Co. 532
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Nash Engineering Co. 402
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Power Plant Engineering 311
53 W. Jackson Blvd., Chicago, Ill.

Precise Tool & Manufacturing Co. 706, 708
Farmington, Mich.

%Proportioneers, Inc% 505
9 Codding St., Providence, R. I.

R

Rapids-Standard Co. 617, 619, 621
535 Bond Ave., N. W., Grand Rapids, Mich.

Reed Roller Bit Co. 302
Houston, Texas

Reeves Pulley Co. of N. Y. 303
76 Dey Street, New York, N. Y.

Reintjes, Geo. P., Co. 403
2517 Jefferson St., Kansas City, Mo.

Revolvator Co. 120, 122, 124
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Rhoads, J. E. & Sons 309
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Ric-wiL Co., The 510
Cleveland, Ohio

Robinson, John R. 627
350 W. 31st St., New York, N. Y.

Roy, Milton, Pumps 632
1300 E. Mermaid Ave., Chestnut Hill, Philadelphia, Pa.

S

Sarco Co. 305
475 Fifth Ave., New York, N. Y.

Schrader's, A., Son, Div. Scovill Mfg. Co. 730, 732
470 Vanderbilt Ave., Brooklyn, N. Y.

Service Caster & Truck Co. 404
432 Fourth Ave., New York, N. Y.

Socony-Vacuum Oil Co. 408
26 Broadway, New York, N. Y.

Southern Power & Industry 410
Grant Bldg., Atlanta, Ga.

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T

Tek Bearing Co. 417, 419, 421
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Titeflex Metal Hose Co. 503
500 Frelinghuysen Ave., Newark, N. J.

Tool & Equipment Supply Co. 229
370 Lexington Ave., New York, N. Y.

Trabon Engineering Corp. 207
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Union Tool Co. 740
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Wilson Chemical Feeders (Inc) 407
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Wright-Austin Co. 104
315 W. Woodbridge St., Detroit, Mich.

Y

Yale & Towne Manufacturing Co. 622, 624
Philadelphia, Pa.

Yoder Co. 221
Cleveland, Ohio

ratios and horsepowers.

FOSTER ENGINEERING COMPANY
FOSTER AUTOMATIC VALVES
ESTABLISHED 1879

for Accurate REGULATION OR CONTROL

PRESSURE REDUCING REGULATORS

for STEAM, LIQUIDS, GASES

Type 39-Q1. Double seated
Type 39-Q2 also available

One of the latest developments in pressure reducing regulators — an air-loaded dome design for the accurate regulation of high and low pressure fluids.

Built for initial pressures up to 2500 lbs. per sq. in. and temperatures up to 1000° F., this valve will handle pressure reductions of a magnitude previously impractical in a single stage.

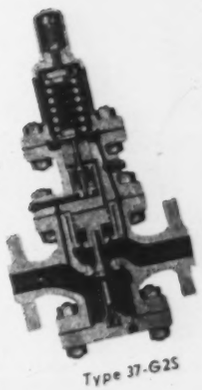
There are no operating springs in this simple, single-seated regulator. A constant loading is imposed by air, thereby insuring constant regulation. Accuracy is unaffected by spring deflection and hysteresis.

for STEAM

Built for pressures up to 1500 lbs. and 900° F. total temperature, the improved Foster Type 37-G2 Pressure Reducing Regulator assures accurate regulation despite widest variations of initial pressure.

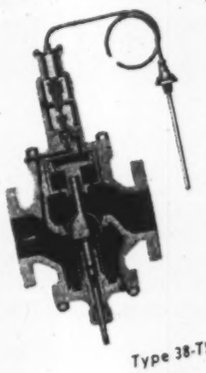
Single-seated for dead-end service, both pilot and main valve are protected by internal strainers from pipe line sediment.

Streamlining of body distributes and assures free flow of steam, while construction of main valve provides maximum lift to minimize pulsating and wire drawing—affords graduated flow and modulating control. Can be fitted with locking cap or hand wheel.



Type 37-G2S

TEMPERATURE REGULATORS



Type 38-T9

The Foster Type 38-T9 Temperature Regulator is an internally pilot-operated, piston-actuated valve for controlling temperatures within ± 1° F.

Single-seated for dead-end service, this regulator is built in sizes of 1/2 to 12 inches for pressures of 25 to 450 lbs., and for temperatures up to 300° F.

An essential feature of this design is that with relatively little temperature change (± 1° F.), the valve will travel from closed to fully opened position.

This regulator also is equipped with a temperature over-travel protective device.

STEAM SIREN

This siren can be heard for miles, and works fast—its rising sound pitch or howl reaches its peak in from three to five seconds, depending on the maximum pitch for which this siren is set. It can be used for signaling because of its sharp sound cut-off.

If a constant pitch is desired, this siren can be so ordered or factory converted into a revolving cylinder-type of horn which produces practically a single pitch from starting to full speed as contrasted with conventional rising pitch or howl.

Type 45
A smaller size—
Type 30—available

- REDUCING VALVES
- TEMPERATURE REGULATORS
- PUMP GOVERNORS
- SIRENS
- ...plus eight sections of useful engineering data

The above shows but four of the scores of Foster Automatic Valves described in our new complete catalog. Write for your copy, on your company's letterhead, please.

FOSTER ENGINEERING Company

109 MONROE STREET, NEWARK, N. J.

At Booth 428 Madison Square Garden—November 30 to December 4, 1942.

12F-E-5

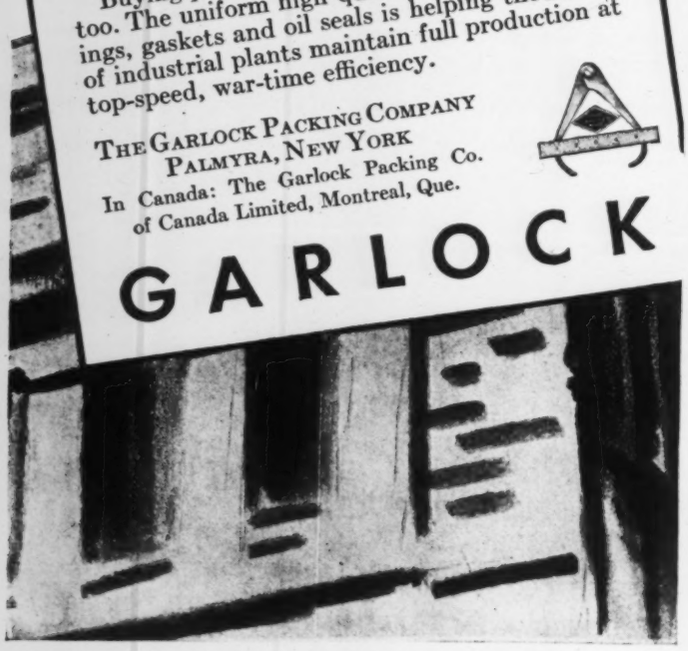
BUY MORE WAR BONDS

EVERY War Bond you buy helps preserve the freedom for which the Statue of Liberty stands.

Buying *quality* products brings Victory closer, too. The uniform high quality of *Garlock* packings, gaskets and oil seals is helping thousands of industrial plants maintain full production at top-speed, war-time efficiency.

THE GARLOCK PACKING COMPANY
PALMYRA, NEW YORK
In Canada: The Garlock Packing Co. of Canada Limited, Montreal, Que.

GARLOCK



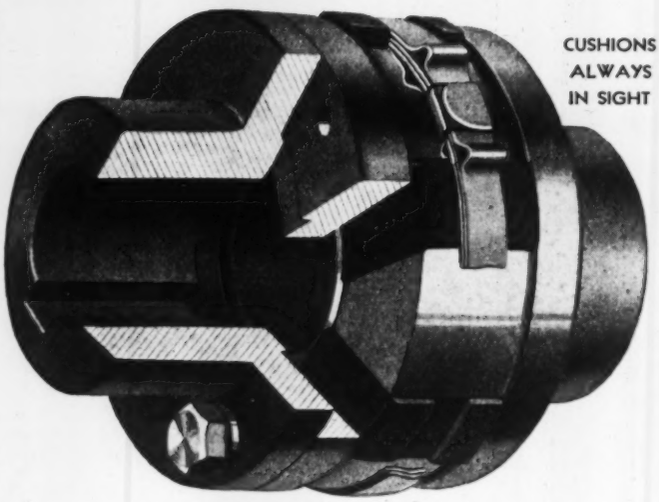
Saving Shutdowns

THIS WAY

ADDS TIME TO YOUR PRODUCTION SPEED-UP

L-R FLEXIBLE COUPLINGS
TYPE "WQ"

PROTECT AGAINST MACHINE DELAYS - - - KEEP MEN ON OUTPUT JOBS!



CUSHIONS ALWAYS IN SIGHT

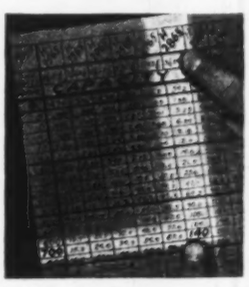
L–R TYPE "WQ"

Pat. and Pats. Pending
1¾" to 13¾" bore. 2.8 to 2350 H. P. at 100 R. P. M.

In L-R Type "WQ" the design permits independent rotation of either shaft, timing of engine, or removal of either element without moving machine or tearing down coupling. There is *always* a new set of load cushions in the coupling. (Half are idlers except on reverse.) Loads cushions are easily and quickly changed any time machines are not running.

Send for Complete L-R Catalog and Free Selector Charts.

Charts enable *anyone* quickly to select just the right coupling for any job. L-R Couplings are made for every requirement, smallest pumps to steel mills. 3/16" to 16 3/4" bores. Write.



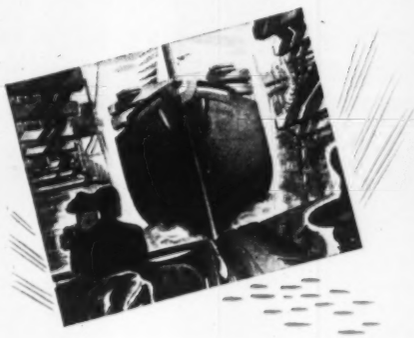
DISPOSE OF YOUR SCRAP PROMPTLY

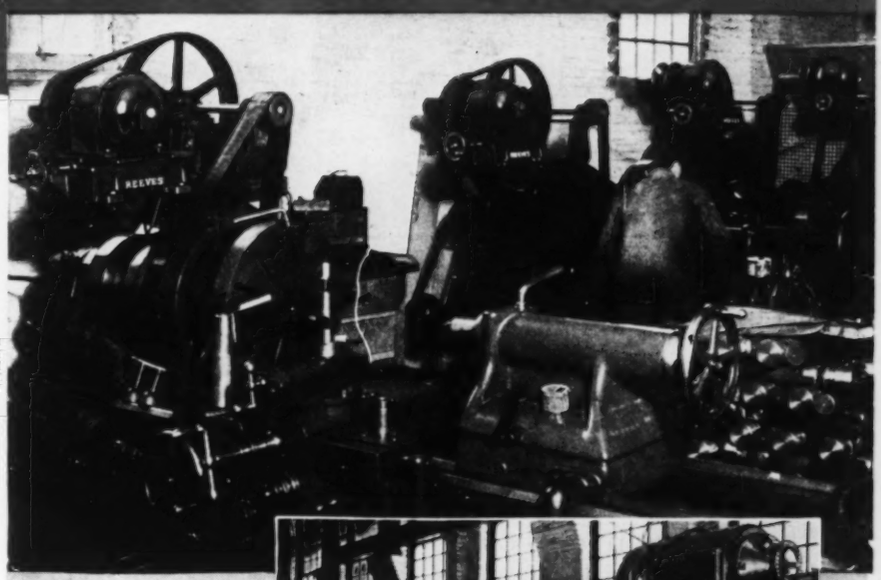
Lovejoy Flexible Coupling Co.
4957 WEST LAKE STREET
CHICAGO, ILL.

NEW LIBERTY SHIP ENGINES

from scratch in 90 days

. . . with Old Machines Equipped with REEVES Variable Speed Drives





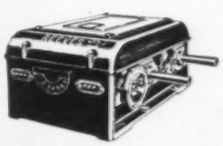
Views of plant featured in this advertisement, showing lathes equipped with REEVES Variable Speed Drives. Approximately 20 REEVES units are in use in this one plant, including the Motodrive, Transmission, and Vari-Speed Motor Pulley.

A group of industrialists in a West Coast city wanted to help meet the government's call for more ships. They had a plant—they had the experience—they had the backing. They were offered an order for triple-expansion main propulsion engines for Liberty Ships. But, they didn't have enough machine tools—and new tools were not to be had. There was no time and little material for building new tools. So they took old, obsolete machines—the only kind they could get—equipped many of them with REEVES Variable Speed Drives for complete speed adjustability, and went to work.

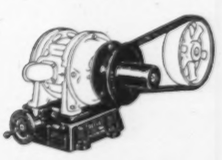
Within 90 days the first engine was delivered. Today a steady stream of engines is being turned out. This record is certainly a tribute to American ingenuity and resourcefulness, and REEVES is proud to have had a part in it. . . . Booklet MEG-423 gives other examples of how REEVES drives give old machines greater precision and help new operators save time and material. Write for it.

REEVES PULLEY COMPANY
COLUMBUS, INDIANA

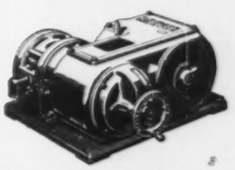
THE 3 BASIC UNITS IN THE REEVES LINE



VARIABLE SPEED TRANSMISSION for infinite speed adjustability over wide range—2:1 through 16:1. Fractional to 87 h.p.



VARI-SPEED MOTOR PULLEY for application to shaft of any standard constant speed motor; 3:1 range. To 15 h.p. Forms actual drive to machine.



MOTODRIVE—Combines motor, variable speed drive and gear reducer (if needed) in one compact unit. To 10 h.p.; speed range 2:1 through 6:1.

REEVES *Accurate Variable* Speed Control

Accomplishments of

A.S.M.E. Power Division

1941–1942

The Power Division has during the past year participated in each of the four national meetings of the Society and has sponsored or co-sponsored papers at each of the four national meetings.

The papers presented covered a wide variety of subjects. Some of the papers of the Power Division have dealt either directly or indirectly with many phases of the war effort. An attempt has been made in round-table discussions to bring forcefully to the attention of power plant operators methods by which more power can be produced from existing equipment.

The Power Division has continued to recognize the necessity of close cooperation between the Power Division and the Society of Naval Architects and Marine Engineers and has co-sponsored a complete evening session in an endeavor to bring about close cooperation between sea and land power engineers.

The Power Division has fully recognized the importance of producing tremendous quantities of steam and large blocks of electrical power and critical materials in the manufacture of synthetic rubber.

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THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS, 29 West 39th St., New York, N. Y.

This Announcement is One of a Series. *Hydraulic—October, Heat Transfer—November*

In Service on TWO FRONTS

SKINNER Unaflow Steam Engines are serving on two fronts in this war. On the important "industrial front," many SKINNER "UNIVERSAL UNAFLOW" STEAM ENGINES, horizontal and multi-cylinder vertical types, are driving generators that furnish electricity for light and power to some of the nation's best known plants engaged in manufacturing vital wartime materials. Others are driving pumps, blowers, and compressors for refrigeration equipment.

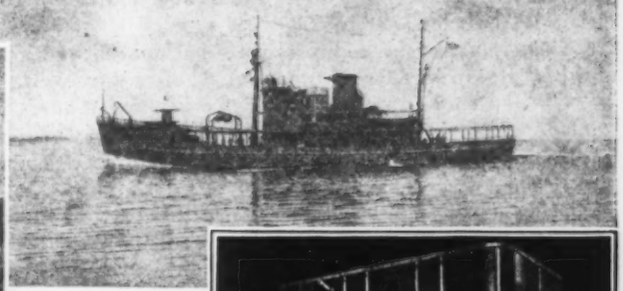
On the "marine front," SKINNER MARINE UNAFLOW STEAM ENGINES are propelling not only industrial ships, ranging in size and type from the small, powerful tug to the world's largest automobile, freight car and passenger ferryboat, but also ships of various types of the Army and Navy.

Our production facilities are being devoted entirely to building SKINNER Engines for the war program.

SKINNER ENGINE COMPANY FOUNDED IN 1868 **ERIE, PA.**

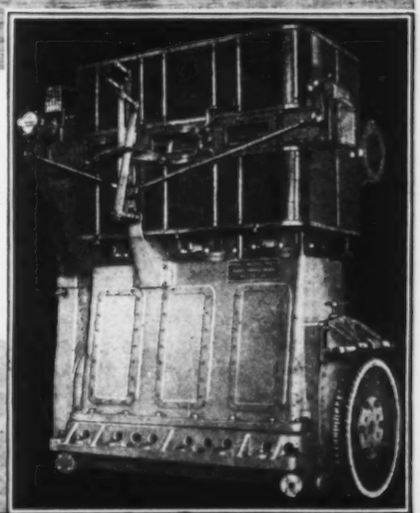
Proudly we fly the Army-Navy "E" Flag, awarded for excellence in production

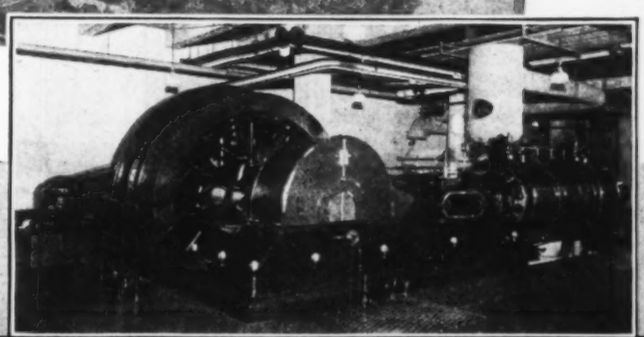
MARINE



INDUSTRIAL

SKINNER Marine Unaflow Steam Engine





SKINNER Horizontal "Universal Unaflow" Steam Engine

SKINNER UNAFLOW STEAM ENGINES

For boring of steels . . . use KENNAMETAL* single point tools

Tom the foreman says:

KENNAMETAL* Eliminates Multiple-Blade Cutters

"We have found in our shop that since the advent of KENNAMETAL, multiple-blade cutters are no longer necessary to bore steel and we feel it our duty to pass along this production discovery to all plants which are boring steels on war jobs.

"Many shops are still using the antiquated multiple-blade type cutter inherited from the days of tungsten steel boring tools.

"When carbide cutting tips came into existence, shops eliminated the old boring tool design. They failed to realize that a KENNAMETAL tip need not share the cutting load with a number of other blades.

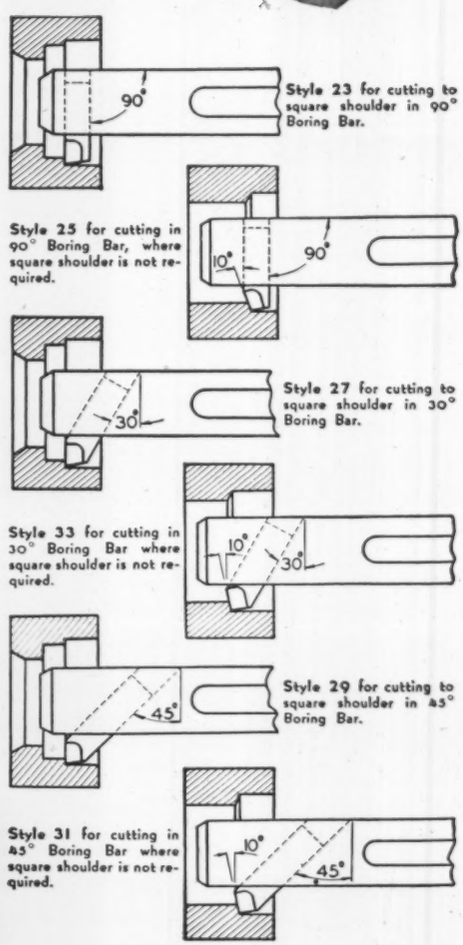
"When a single-point KENNAMETAL boring tool is used on our ordinary boring bar it holds a truer bore than two or four blade tools do. It can be run six times faster and ¼ the feed per revolution as is necessary with a two blade high speed steel cutter. This gives only half the force tending to deflect the boring bar. Furthermore, this single point KENNAMETAL boring tool can be ground off-hand, whereas a multiple-blade cutter must be ground on a cutter grinder and costs less than one-tenth as much as the two-blade type.

"In addition, the single-point boring tool with a small nose radius reduces chatter caused by tool pressure and can be positioned more easily than the multiple blade type tool.

"The operation diagrams at the right show standard boring applications of KENNAMETAL tools which can be ordered direct from the McKenna Metals Company catalog, at a small fraction of the cost of a multiple blade cutter despite the fact that the single-pointed tool can turn out more work."

Write for your copy of the new Catalog No. 43.

*INVENTED AND MANUFACTURED IN U. S. A.



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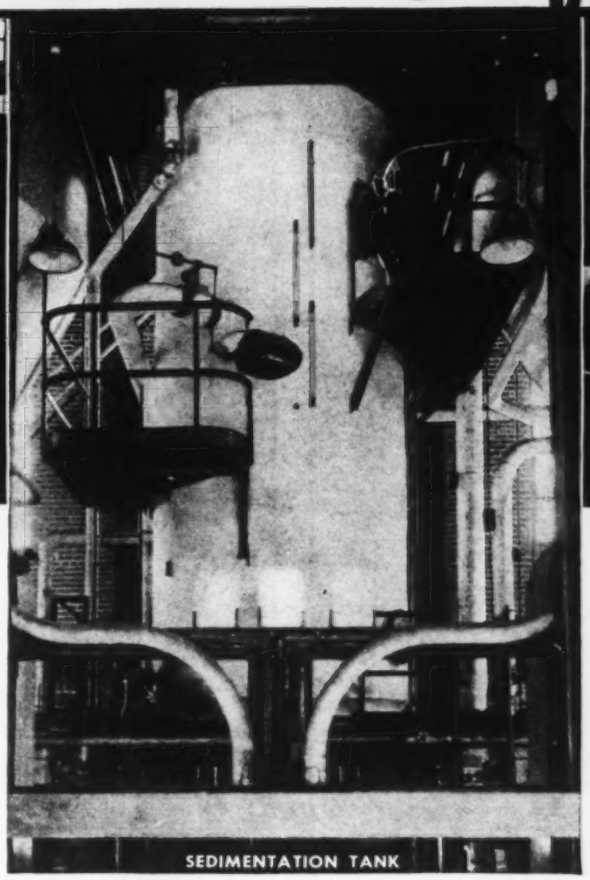
Foreign Sales: U. S. STEEL EXPORT CO., 30 Church St., New York (Exclusive of Canada and Great Britain)

Trade Mark Reg. U. S. Pat. Off.

More than Water Softening—

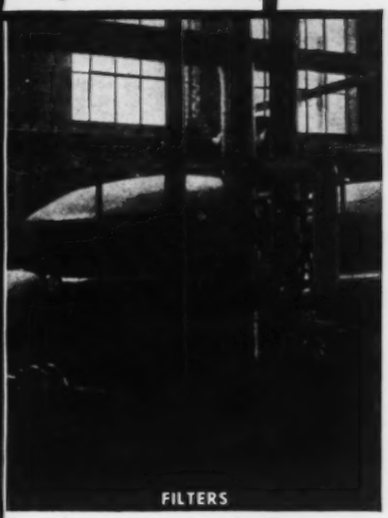
CHEMICAL PROPORTIONER & TANK

Above is shown a Cochrane Chemical Proportioning and Mixing Tank with Proportioner shown at top of tank. Proportioner automatically adjusts chemicals to changes in rate of flow.



SEDIMENTATION TANK

Cochrane Sedimentation Tank where water is heated and reagents mixed with it and softening takes place.



FILTERS

Cochrane Filters are of the pressure type, and charged with a Non-Silicious Filtering Material. The softened and settled water passes through these filters, after which it is pumped to the boilers.

Precipitates settle in sedimentation Chamber and softened water is withdrawn through uptake funnel to filters.

Cochrane Water Conditioning Fits Treatment to Problem

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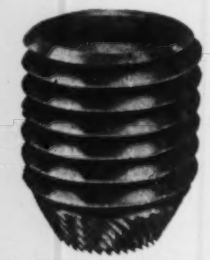

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When tightened as usual, the *knurled* points "dig in" and hold the screw tight regardless of vibration. Can be backed out with a wrench and used again and again.

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and . . . . . you can speed up production and assembly operations with *Knurled*

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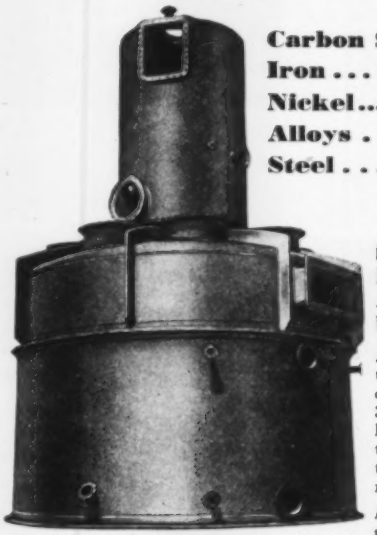

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Downingtown is approved by Hartford for A.S.M.E. Code U-69 Welding.

At left is shown a section of a saturator, one of four, each 16' 8¼" x 34' 3" O. A, fabricated by Downingtown—fitted at our shops—then, taken apart for shipment.

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DOWNINGTOWN, PA.
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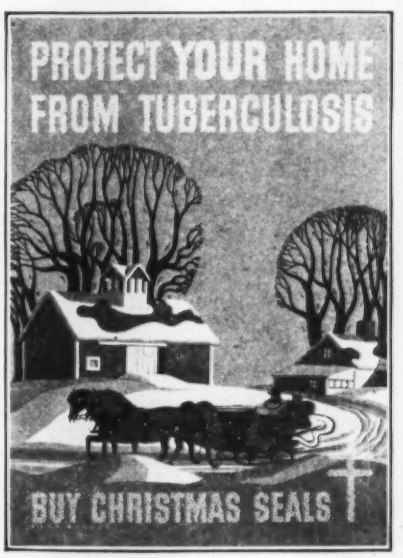


Data on Relaxation Resistance of Nickel Alloy Springs

Report presented at 1941 Annual Meeting of the American Society of Mechanical Engineers now available in printed form

The oxidation and corrosion resistance of INCO Nickel Alloys, combined with ability to retain strength at elevated temperatures, have made them useful in many elevated-temperature spring applications. When load loss at temperatures from 300° F. to 700° F. is a criterion, "K" Monel, "Z" Nickel and Inconel are comparable to high-alloy spring steels, while Monel is more nearly comparable to low-alloy steels.

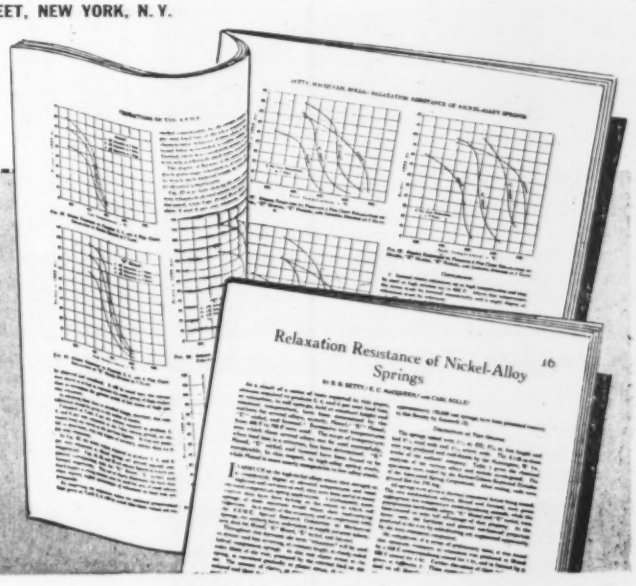
Members of the INCO Laboratories and Development and Research Division, in cooperation with the A.S.M.E. Special Research Committee on Mechanical Springs, have now furnished accurate laboratory data for Monel*, "K" Monel*, "Z" Nickel*, and Inconel*, which point to the following conclusions:

1. Inconel resists relaxation up to high temperatures and may be used at high stresses up to 650° F. Above this temperature the stress must be lowered considerably and a slight degree of relaxation must be tolerated.
2. "Z" Nickel and "K" Monel will withstand higher stresses than Inconel at the lower temperatures, consistent with their generally higher level of mechanical properties.
3. "Z" Nickel may be used with high stress at temperatures up to 550° F. and with reduced stress up to 600° F.
4. "K" Monel may be used with high stress up to 450° F. and reduced stress up to 500° F.
5. Where other factors such as corrosion resistance are involved, Monel offers possibilities as a spring material for temperatures up to about 400° F. and at moderate stress levels.
6. Monel springs should be stress-equalized for 1 hr. at 650° F. where relaxation resistance is desired.
7. Inconel springs should be stress-equalized for 1 hr. at 900° F. for service at elevated temperatures.

Complete technical information on this subject has been published in bulletin form. You are invited to send for this paper by using the coupon below.

THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL STREET, NEW YORK, N. Y.

"Monel" and other trade-marks which have an asterisk associated with them are trade-marks of The International Nickel Company, Inc.



THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York, N. Y.

Gentlemen: Please mail me a copy of the paper "Relaxation Resistance of Nickel Alloy Springs" (B. B. Betty, E. C. MacQueen, and Carl Rolle)

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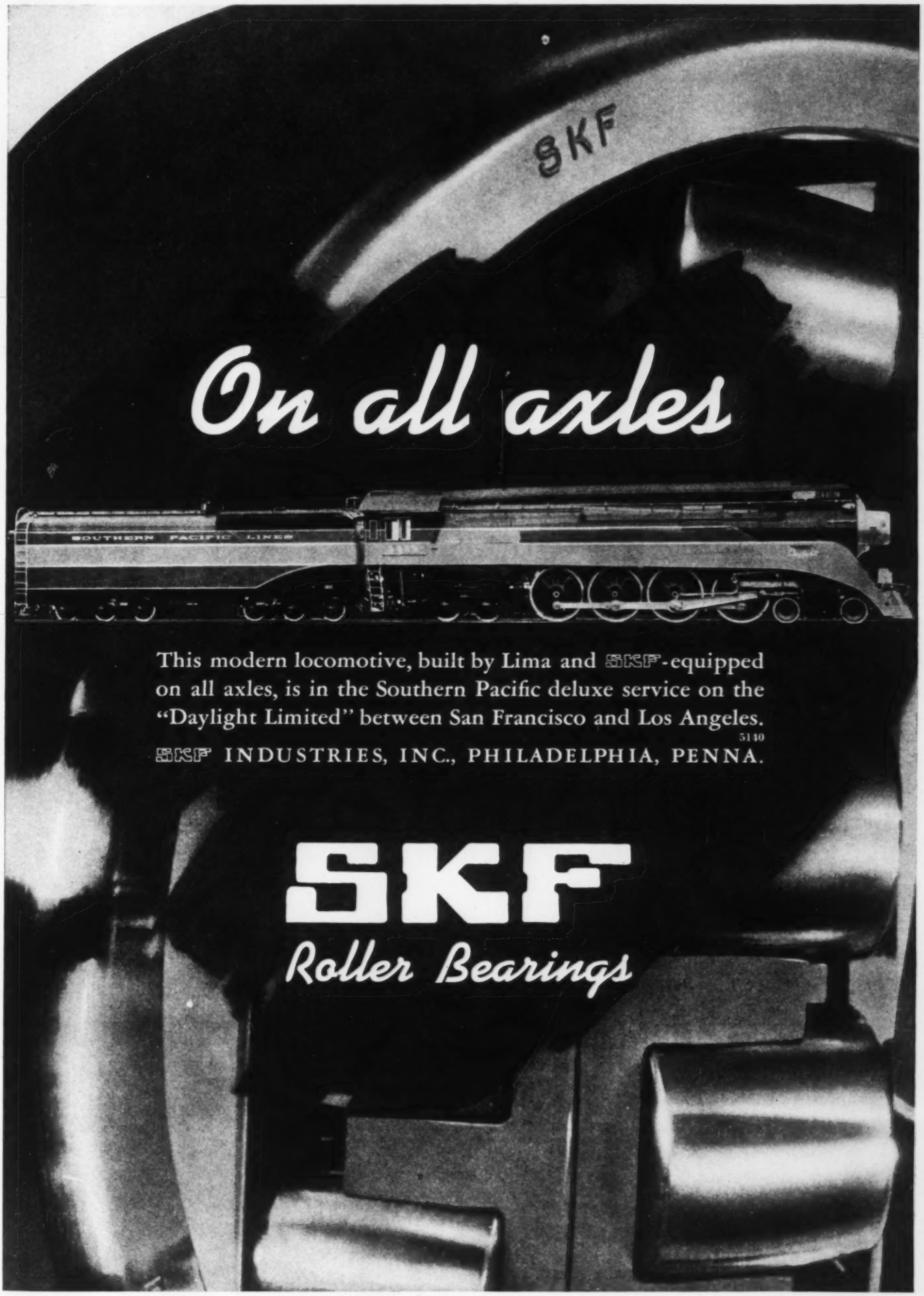
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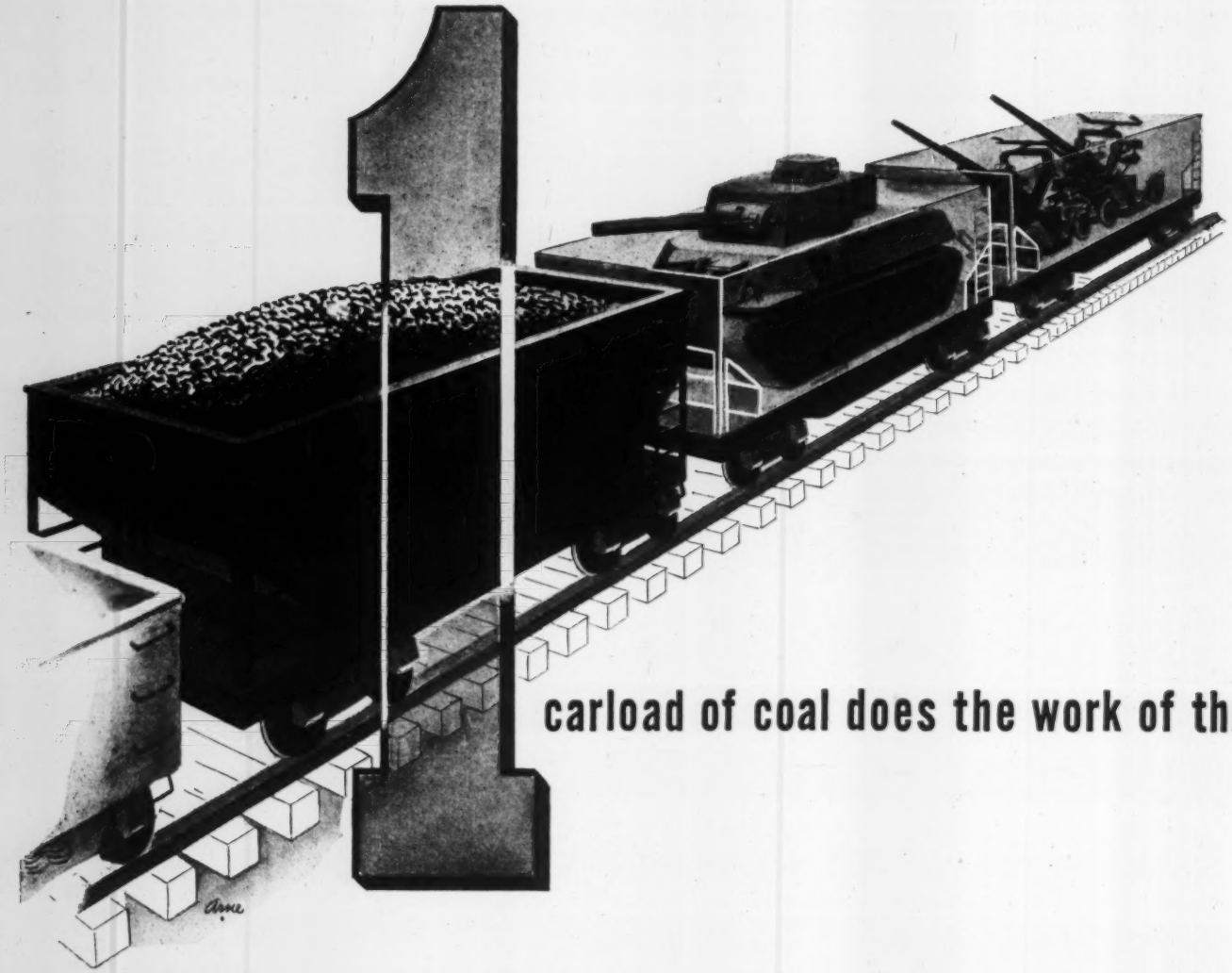

1 carload of coal does the work of three

The railroad coal car . . . a mute witness . . . reveals one contribution to the success of our global war that results from twenty years of progress in the generation of electrical energy.

In World War I it was necessary to burn 3.39* pounds of coal to produce one kilowatt hour (enough juice to light a 50 watt bulb for 20 hours). By contrast, the same amount of electricity is produced today from only 1.3* pounds of coal.

Thus, a single coal car, transporting fuel to a central station, now does the work of three. And our burdened railroads are relieved to haul two additional cars of tanks, guns or other munitions.

During the years when the painstaking efforts of power engineers were producing this result, Combustion Engineering was privileged to work in close collaboration with many of the country's leading utilities in designing and building hundreds of steam generating units that today are helping the utilities to meet the nation's vast electrical demand, and with two-thirds less coal. A672

*National Average of the Federal Power Commission for the years *1920* and *1941* respectively.

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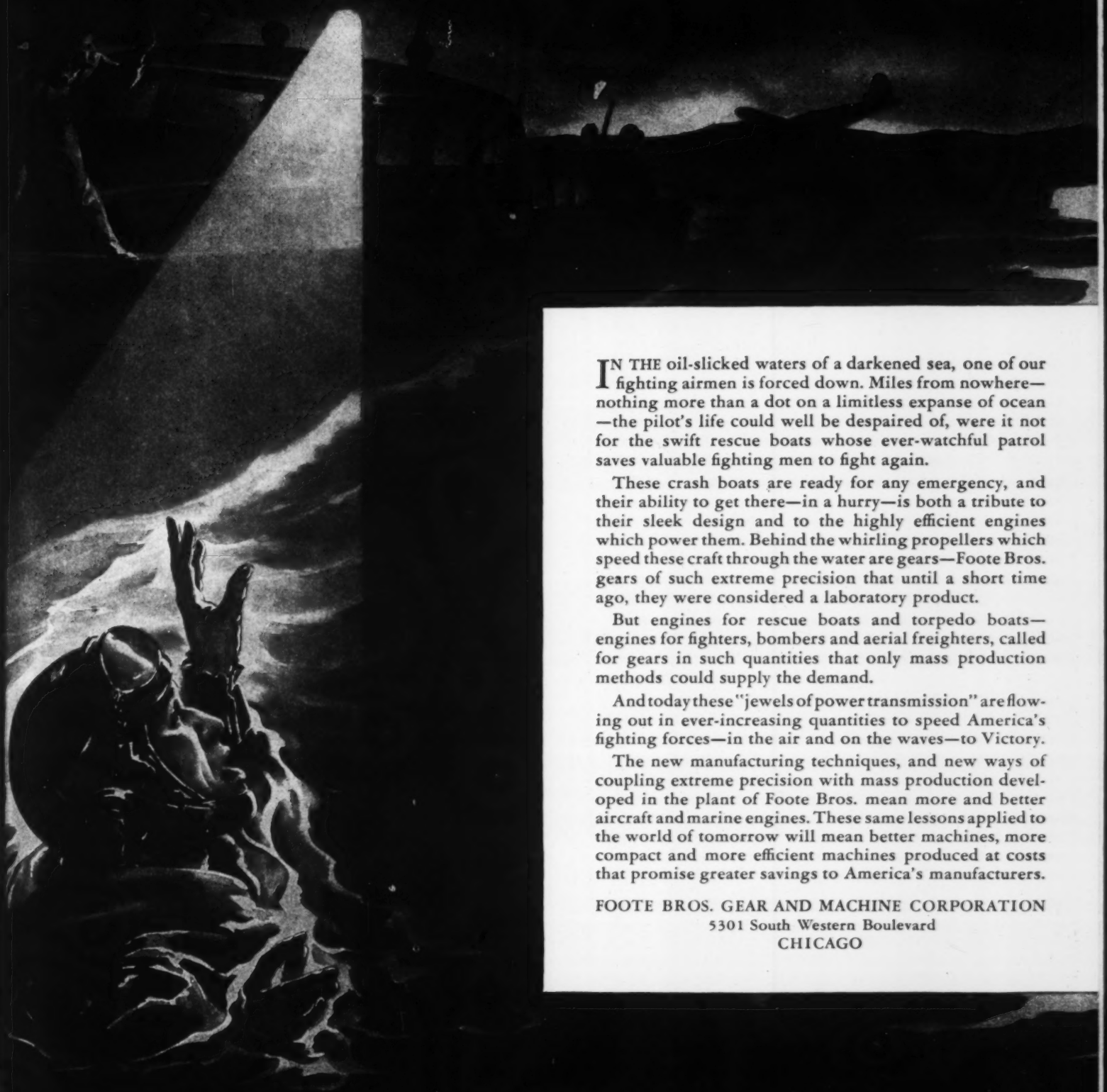

IN THE oil-slicked waters of a darkened sea, one of our fighting airmen is forced down. Miles from nowhere—nothing more than a dot on a limitless expanse of ocean—the pilot's life could well be despaired of, were it not for the swift rescue boats whose ever-watchful patrol saves valuable fighting men to fight again.

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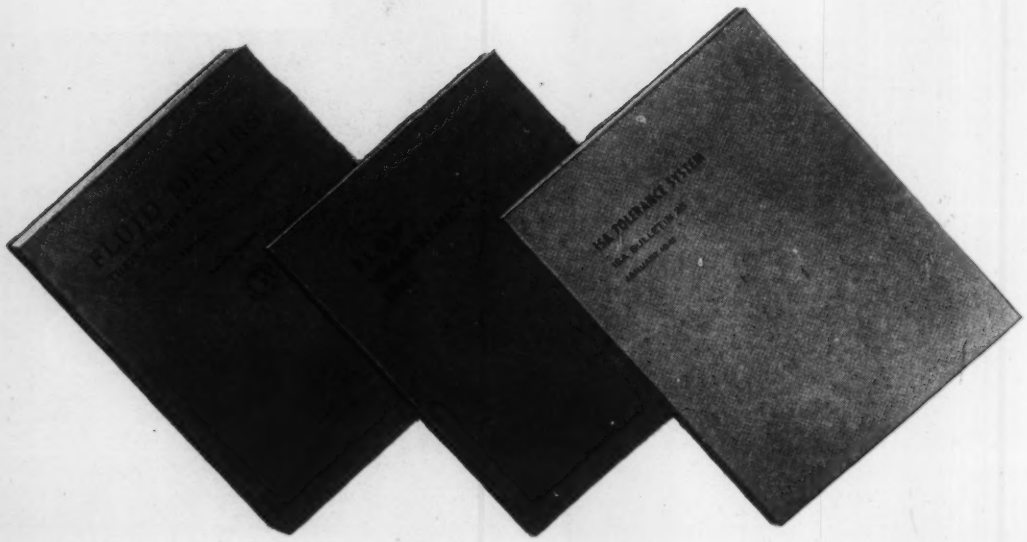

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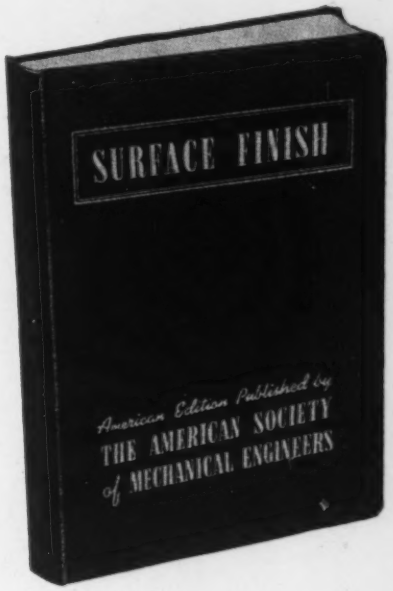

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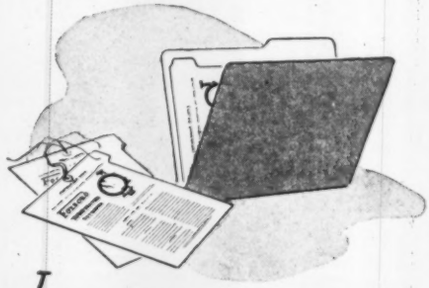

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- ★ Keep spare part supplies down to a minimum.
- ★ And above all things not to overstock.

If all our customers will adhere to this policy, vital materials as well as valuable man hours will be saved for our defense work.

We earnestly solicit your cooperation.

T-1149

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TERRY SQUARE, HARTFORD, CONN.

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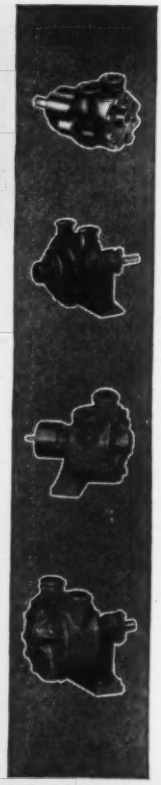

The inside story of Tuthill dependability can be summed up in two words: PRECISION MANUFACTURE. Hundreds of thousands of Tuthill Pumps in service prove that it takes skill, experience and production efficiency to create equipment so outstanding and dependable in performance.

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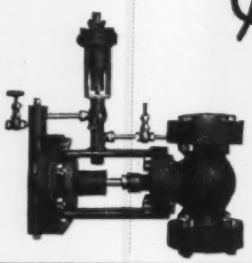

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Catalog H-11 explains

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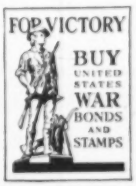

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VINYLITE Elastic Plastics are immune to many of the factors that cause rubber to deteriorate. They will not oxidize, and show no appreciable change even after prolonged aging. In abrasion resistance tests, certain types have proved superior to high-grade rubber compounds. Their tensile strength is higher than that of most rubber compounds. Under extreme climatic conditions, they do not become sticky or brittle —certain types retaining their flexibility even at –50 deg. F. Other types are non-flammable. Depending upon the formulation, unusual resistance to water, oils, and many corrosive chemicals can be obtained. Transparency is another unique feature impossible to obtain with rubber.

VINYLITE Elastic Plastics are available for war production needs in sheeting form and as compounds for molding, extrusion, and calendering. Sheeting is supplied in a wide range of transparent and opaque colors, in rolls of various widths and thicknesses. Compounds can be either injection or compression molded, extruded into continuous rods and tubes or into wire and cable coverings, or calendered directly onto cloth. For those industries which have the necessary processing equipment, such as the rubber industry, powdered VINYLITE Resins are available which can then be pigmented, blended with plasticizers, and formulated into flexible materials.

RUBBER-PROCESSING FACILITIES USABLE

Rubber manufacturers can realize important savings with VINYLITE Elastic Plastics. The handling of these materials is essentially the same as with rubber, and, with slight modifications, the same equipment can be used. However, no curing or vulcanizing is required, because VINYLITE Elastic Plastics come from the mold, extruding die, or calender mill as completed products.

If you are engaged in war production and seek flexible materials with the unusual resistance and durability of VINYLITE Elastic Plastics, we suggest that you enlist the full co-operation of our technical staff. Booklet P-5, "Vinylite Resins—Their Forms, Properties and Uses," describes these and other VINYLITE Plastics in detail.

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RESISTANCE TO FLAME

Insulation made of non-flammable types of VINYLITE Elastic Plastics is used widely on wire and cable in place of rubber and other dielectric materials.

NON-OXIDIZING AND NON-AGING

Oxygen bomb tests prove VINYLITE Elastic Plastics immune to oxidation. Thirty days' exposure to sunlight and weathering on coated cloth for Army raincoats also has no appreciable effect.

WATER AND CHEMICAL RESISTANCE

After 24 hours' immersion in water at 25 deg. C., absorption is only 0.20 per cent with certain types. Excellent resistance to oils, grease, and many corrosive chemicals can also be obtained.

COLOR AND TRANSPARENCY

VINYLITE Resins can be pigmented to meet any color requirements. Unlike rubber, they can be formulated into transparent as well as opaque forms.

FLEXIBILITY AND STRETCHABILITY

Certain types withstand 3,000,000 cycles in a mechanical flexing tester. They may be elongated 300 per cent at room temperature, but will return to original length without "snapback."

ELECTRICAL INSULATION

Dielectric strength, in 0.025-in. thickness at 25 deg. C., ranges from 900 to 1,100 volts per mil, and 300 to 330 volts per mil in 0.125-in. thickness.

meet many different fabrication and application needs...

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Unlike rubber, complete products can be formed from VINYLITE Elastic Plastics by high-speed injection molding. This process brings marked economies on long runs.

COMPRESSION MOLDING

In many instances, VINYLITE Elastic Plastics can be compression molded in existing rubber molds, with minor modifications. Parts come from the mold ready for use — curing and vulcanization are avoided.

SCREW EXTRUSION

VINYLITE Elastic Plastics can be fabricated in standard types of screw extruders into continuous tubes, rods, and insulation coverings for wires and cables.

SPREADER COATINGS

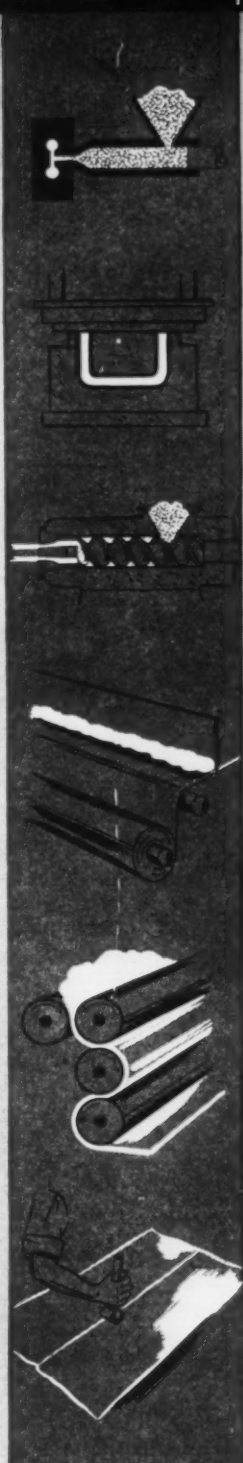
Dissolved in suitable solvents, VINYLITE Elastic Plastics can be applied to cloth on standard spreader-coating equipment.

CALENDERING

Durable, waterproof coatings on cloth, up to .030 inches thick, can be applied by standard calender mills used for rubber.

FABRICATING

Flexible sheeting and coated cloth can be either cemented or heat-sealed. Embossing is used to obtain various surface effects.



make possible many advanced wartime products...

INFLATABLE EQUIPMENT

Inflatable equipment, waterproofed by coating one or both sides of the cloth with VINYLITE Elastic Plastics is more durable than similar equipment made from rubber-coated cloth.

AIRCRAFT PARTS

Flexible even at —50 deg. F., VINYLITE Elastic Plastics are used for transparent aircraft wiring conduits, weather-resistant windshield wiper blades, floor mats, gromets, and wire terminal insulators.

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Army raincoats, tenting, and equipment paulins coated with VINYLITE Elastic Plastics retain their water resistance — without becoming brittle when cold, or sticky when hot.

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VINYLITE Elastic Plastics are used for upholstering seats in tanks and planes where they are far superior to rubber and artificial leathers in moisture resistance, toughness, and flexing life.

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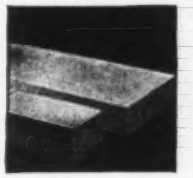

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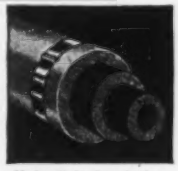

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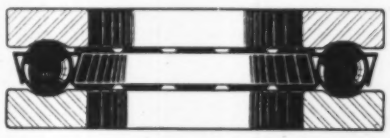

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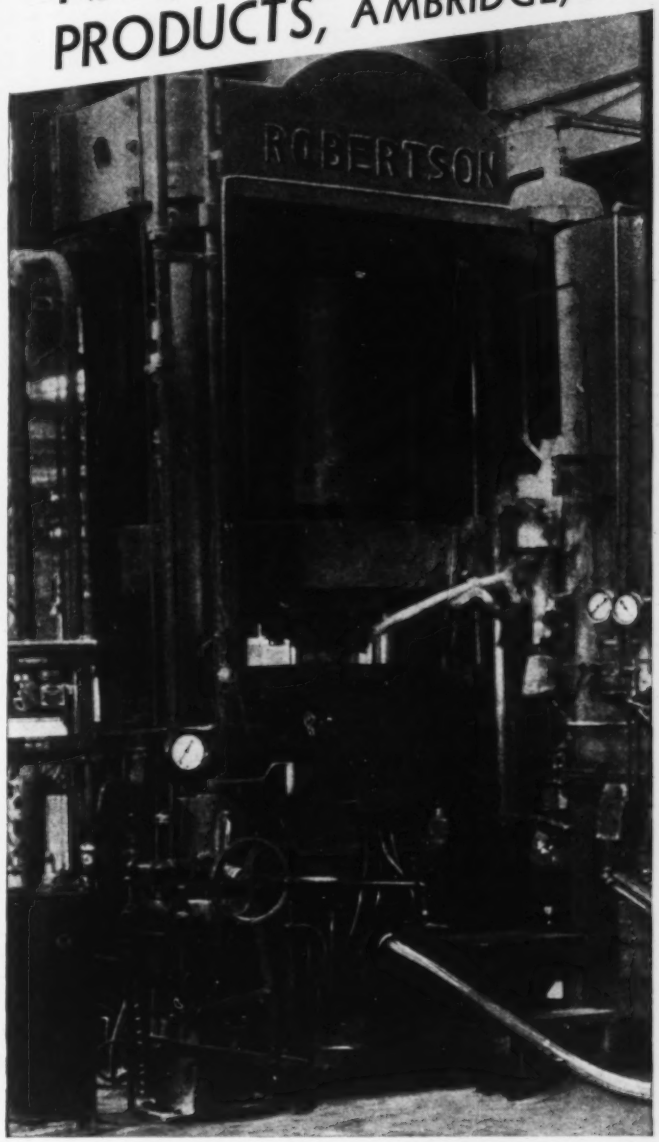

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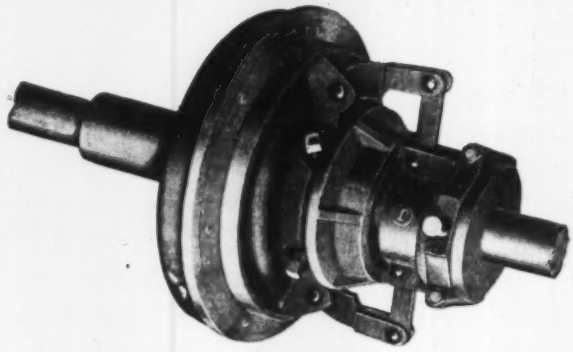

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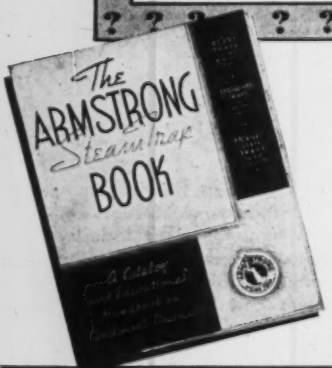

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● By referring to the sectional view below the forces acting on ram and die can be more clearly understood.

Note that the piston is raised and lowered in its cylinder by the single-throw crank and connecting rod, driven direct by the motor through the motor pinion and fly-wheel gear. Notice that the crank shaft is supported rigidly by generously proportioned, bronze-bushed self-oiling bearings mounted directly on the base of the hammer. This rigid mounting is important as this is the point of greatest stress and perfect alignment must be maintained for satisfactory operation.

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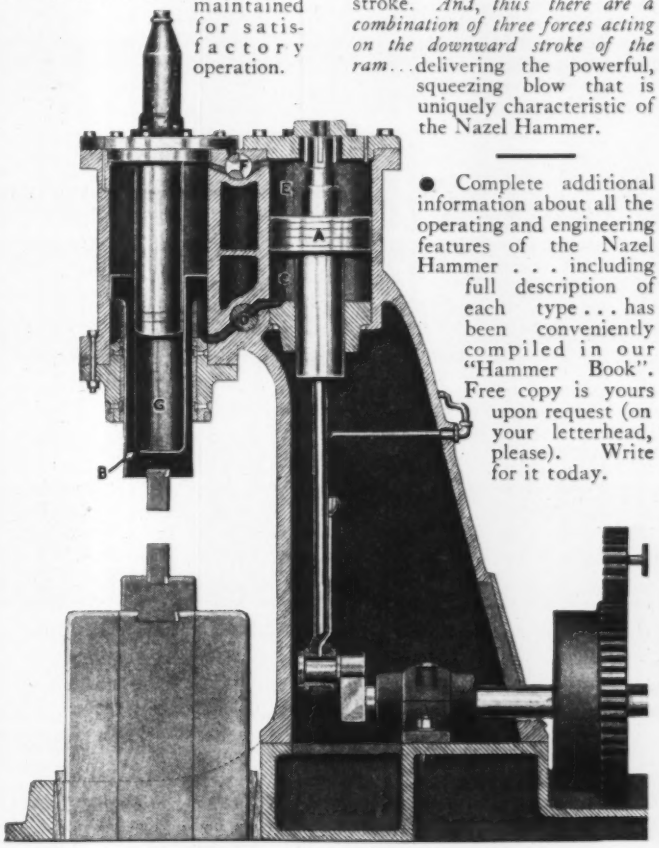

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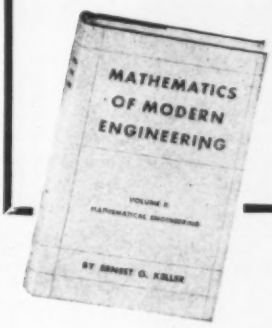

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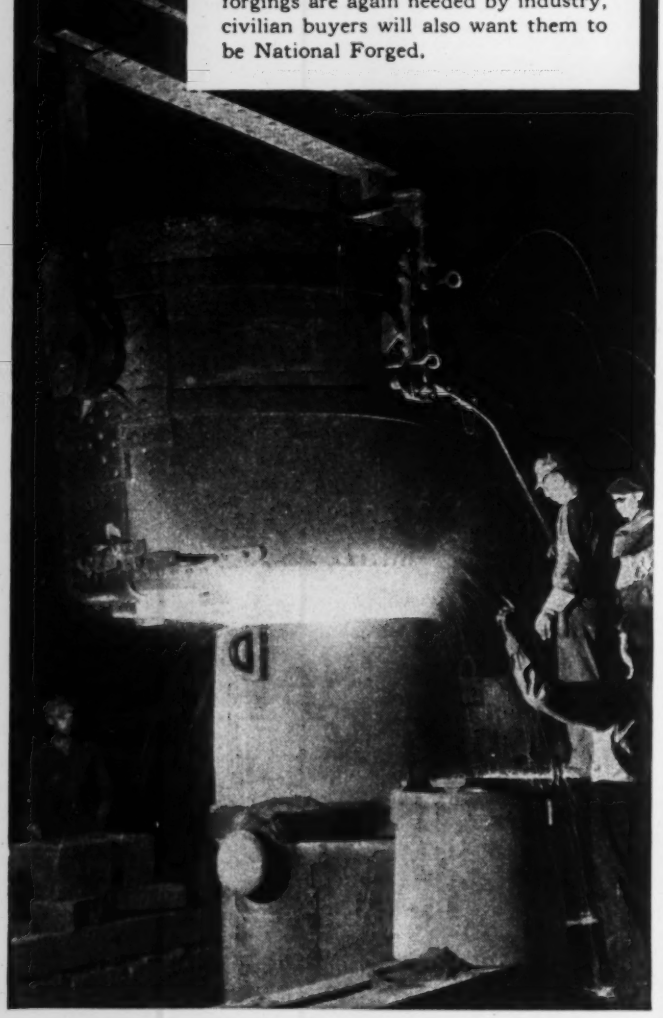

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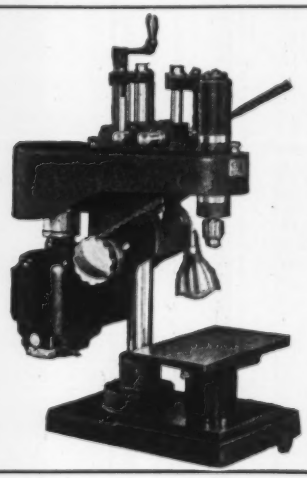

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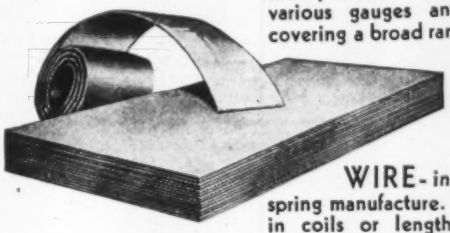

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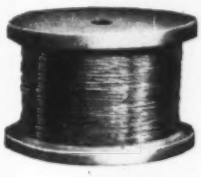

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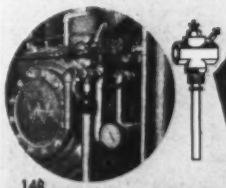

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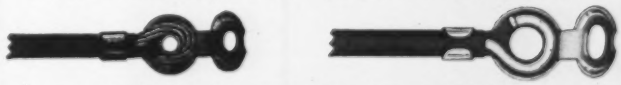

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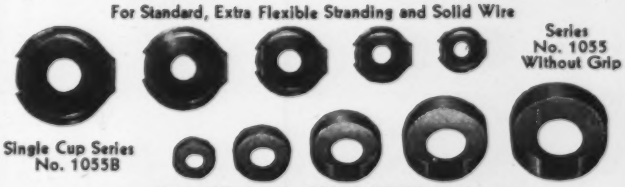

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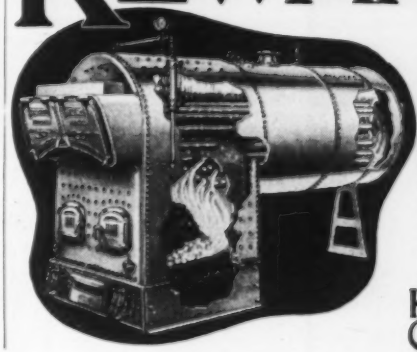

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Partnership—Capital
Manufacturing Facilities

OPPORTUNITIES

Positions Open—Positions Wanted—Equipment, Material, Patents, Books, Instruments, etc. Wanted and For Sale

RATES Classified advertisements under this heading in MECHANICAL ENGINEERING are inserted at the rate of 70 cents a line. 60 cents a line to members of A.S.M.E. Seven words to the line average. A box number address counts as one line. Minimum insertion charge, 5 line basis, maximum 20 lines. Display matter carried in single column units of multiples of one inch at flat rate of $10 per inch per insertion. Copy must be on hand not later than the 10th of the month preceding date of publication.

POSITIONS OPEN

METHODS ENGINEER

to take over Timestudy and Tool Design Departments. Must be able to devise efficient methods in manufacture of parts. Must be executive type with good mechanical background in manufacturing field. Must take full responsibility. Company located in Midwest, 2500 employees. Permanent position.

Address CA-685, care of "Mechanical Engineering"

CHIEF INSPECTOR

to take over all inspection problems. Should have all around qualifications and must take full responsibility. Good mechanical background. Company has over 2000 employees engaged in machine shop, foundry, and forge shop. Midwest location. Permanent position.

Address CA-684, care of "Mechanical Engineering."

A MECHANICAL ENGINEER with equipment and process design and development experience required at once for Leader, Process Engineering Group in Development Department now being established. Program relates to lumber, plywood, fibrous products, chemicals, etc. Location West Coast. Submit details education, experience, references, salary requirement, photograph, draft status. Address CA-671, care of "Mechanical Engineering."

A REAL EXECUTIVE—to be Vice-President and General Manager in charge of production in a plant manufacturing heavy War machinery and employing about 400 men. After the War, plant will revert to the design and building of Heavy Machinery in long established business. Man selected must be not over 50 years of age, who, by actual accomplishment can demonstrate his ability to handle men and capable of earning $10,000.00 a year to start with. He must be in good health and not in the draft. In reply give lineup of experience and references as far as practical. Address CA-682, care of "Mechanical Engineering."

METHODS ENGINEER—Proficient in cost accounting as well as other branches of industrial engineering. Address CA-687, care of "Mechanical Engineering."

SENIOR INDUSTRIAL ENGINEER—College graduate, preferably engineering degree—good personality. Address CA-686, care of "Mechanical Engineering."

MECHANICAL ENGINEER, college graduate, qualified to inspect, test and recondition turbines, reduction gears, centrifugal pumps and electric generating equipment at various operating properties of public utility system. Applicant must state salary expected, experience and qualifications. Should be in reasonably good health, free to travel and under age 55. Those employed at their highest skills in war work will not be considered. Address CA-688, care of "Mechanical Engineering."

MECHANICAL ENGINEER, college graduate, qualified to analyze water supply, pumping and distribution system problems and to make plans and recommendations for improvements. Also to analyze operating statistics and make recommendations effecting economies. Employment would be at general offices of public utility system. Applicant must state salary expected, experience and qualifications, should be in reasonably good health, free to travel and under age 55. Those employed at their highest skills in war work will not be considered. Address CA-689, care of "Mechanical Engineering."

INSTRUMENT EXPERT by leading aircraft engine manufacturer in East. Engineering training and calibration experience required although not necessarily in aircraft engines. Must be able to devise new and more nearly accurate methods of temperature and pressure measurement and to improve existing methods. No applications sought from persons employed in war production. Address CA-691, care of "Mechanical Engineering."

POSITIONS WANTED

ASSISTANT PROFESSOR OF MECHANICAL ENGINEERING, single, 30, has taught most of undergraduate mechanical engineering subjects. Three years of varied industrial experience. Address CA-681, care of "Mechanical Engineering."

SALES MANAGER OR SALES ENGINEER, M.E. Graduate, broad selling experience both domestic and foreign, sound working knowledge of manufacturing methods and management. At present engaged in making economic analyses of large business undertakings. Speak French and Spanish fluently. Will locate anywhere. Address CA-690, care of "Mechanical Engineering."

REPRESENTATIVES AVAILABLE

ACCOUNT WANTED—Eastern Sales Representative, well connected Industrials, Utilities and Equipment, U. S. Engineers, Ordnance, Navy, with extensive direct and distributor sales; age 45; will consider additional recognized product; Engineering graduate; office and car; no promotions; available basis, service guarantee and commission. Duration or Permanent. Address CA-683, care of "Mechanical Engineering."

EMPLOYMENT AGENCIES AND SERVICE BUREAUS

EXECUTIVES, ENGINEERS, DESIGNERS, METALLURGISTS needed for Cleveland area. Good salaries. No fee until placed. Write immediately to Bradley Placement Service, 555 Leader Building, Cleveland, Ohio.

SALARIED POSITIONS—$2,500 to $25,000. This advertising service of 32 years' recognized standing negotiates for positions of calibre indicated. Procedure individualized to your personal requirements. Retaining fee protected by refund provision. Identity covered. If salary has been $2,500 or more send for details. R. W. Bixby, Inc., 115 Delward Bldg., Buffalo, N. Y.

E. G. Stroud, Member A.S.M.E., President The Cleveland Engineering Agency Co., 219 Huron-Ninth Building, Cleveland, Ohio, has for 30 years been engaged in technical placement work. Employers wishing to engage Executives, Engineers, Designers, Draftsmen or other technical men are invited to use this service. Applicants available should write for blank and list of opportunities.

READ the ---

CLASSIFIED ADVERTISEMENTS

appearing in this section each month

It will pay you to watch the announcements on this page for an opportunity that you may be looking for or one that may be of interest to you.

THE PATH OF WAR

Telephone lines are the paths of war. Marching over them in endless file are messages that must get through.

There's no way to build more lines because materials are going into arms for men like these American para-ski troops. But there is a way you can help keep the wires clear for urgent needs.

Please don't make Long Distance calls to centers of war activity unless they are VITAL.

Remember — war calls come first!

Bell Telephone System

U. S. PARA-SKI TROOPS

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Advertising forms of
MECHANICAL ENGINEERING
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Space reservations for advertisements to appear in the January issue should reach us not later than December 6th, copy and cuts by December 10th.

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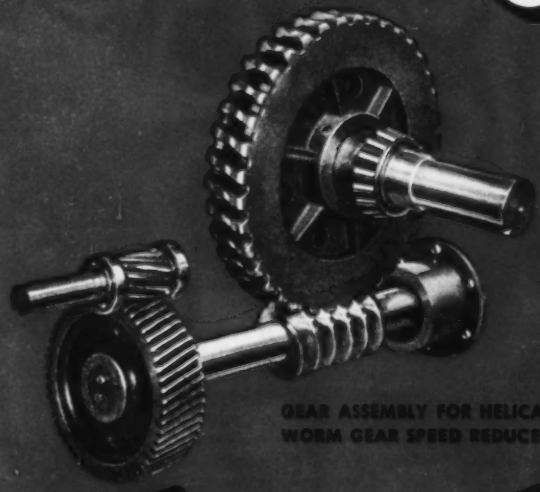
"General GEAR"
IS A FIGHTER TOO...

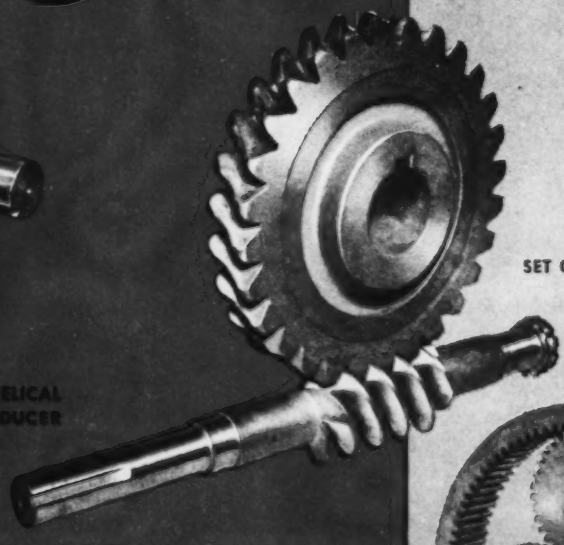
★ He's the guy that makes the Jeeps Jump... He's also the BIG-WORKS in the tank, battleship or airplane... in fact he's the BIG-WORKS in any Power-saving or Power-driving Machinery. HE'S GOTTA BE GOOD. Our organization of many years of Gear Making Experience is going to keep him fighting and to help keep all of us on top.

D.O.James

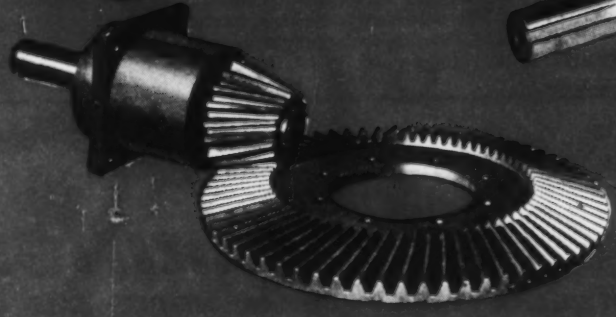
D. O. JAMES MANUFACTURING CO. 1140 WEST MONROE ST., CHICAGO, ILLINOIS



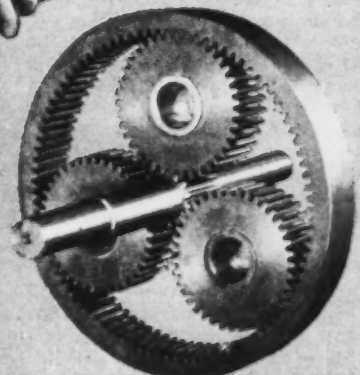
GEAR ASSEMBLY FOR HELICAL WORM GEAR SPEED REDUCER



SET OF WORM GEARS



A SET OF SPIRAL BEVEL GEARS WITH PINION BEARING MOUNTING

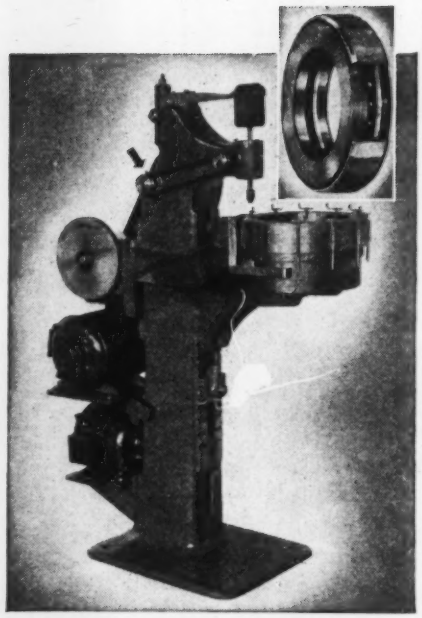


A SET OF PLANETARY GEARS

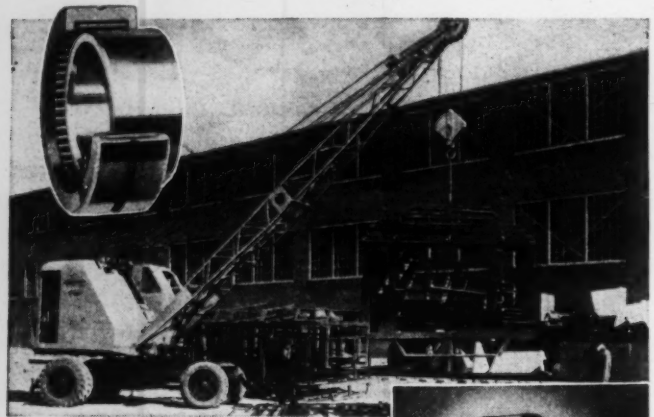
MAKERS OF EVERY TYPE OF GEAR AND GEAR REDUCER

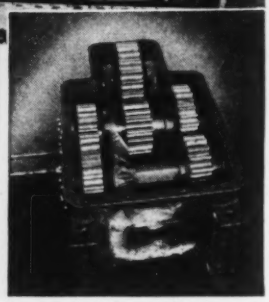
IN THE NEWS
WITH BANTAM BEARINGS

STRIKING POWER! Somewhere in the Pacific, U.S. Aircraft Carriers are seeking the enemy, looking for the chance to "dish-it-out." Back in South Bend, Indiana, other men and women—fathers, uncles, sisters, friends of the boys on the fighting fronts—are "dishing-it-out" too. That's why everyone of us at Bantam is proud of our third award of merit, the Army-Navy E flag with Two Stars. We're proud too, to have Bantam Bearings serving on nearly every type of fighting ship in the U. S. Navy.

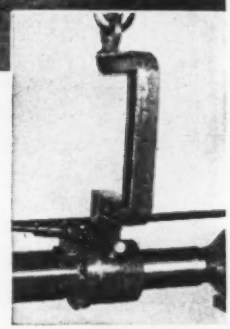


1800 TIMES PER HOUR *a thrust load* is exerted on this Rotary Hammer-type Riveter designed and built by The Grant Mfg. & Machine Co. Bantam Ball Thrust Bearings are used to carry the thrust load between the mainshaft bearing and inner clutch plate as well as the thrust of the mainshaft at point shown in the photo between the spindle pulley and the frame. Because Bantam's line includes all major types of anti-friction bearings Bantam's engineers are in a position to give experienced help and counsel in the design and selection of bearings for any type of job.





THIS SIX-TON "MOBILCRANE" does the job whenever and *wherever* needed. Built by the Osgood Company it operates and travels on a single power unit. In the design of the wheel drive power transmission, shown in close-up, Bantam Quill Bearings support one end of the transmission shafts which operate at 290 to 660 R.P.M. under heavy load—especially when operating in low gear. This interesting application utilizes the compact design and high capacity of Bantam's Quill Bearing. Additional information will be found in our Catalog. Write for your copy of Bulletin N-104.



SWING IT! For grinding large castings, take grinder to the job. That is an outstanding advantage of the swing frame grinder manufactured by the Vonnegut Moulder Corporation. And the "swing frame" (see inset) which holds the grinder chassis turns on a Bantam Quill Bearing to insure freedom of movement and ease of control in manual operation. This is another application where Bantam Quill Bearings are helping industry-at-war "beat the promise."

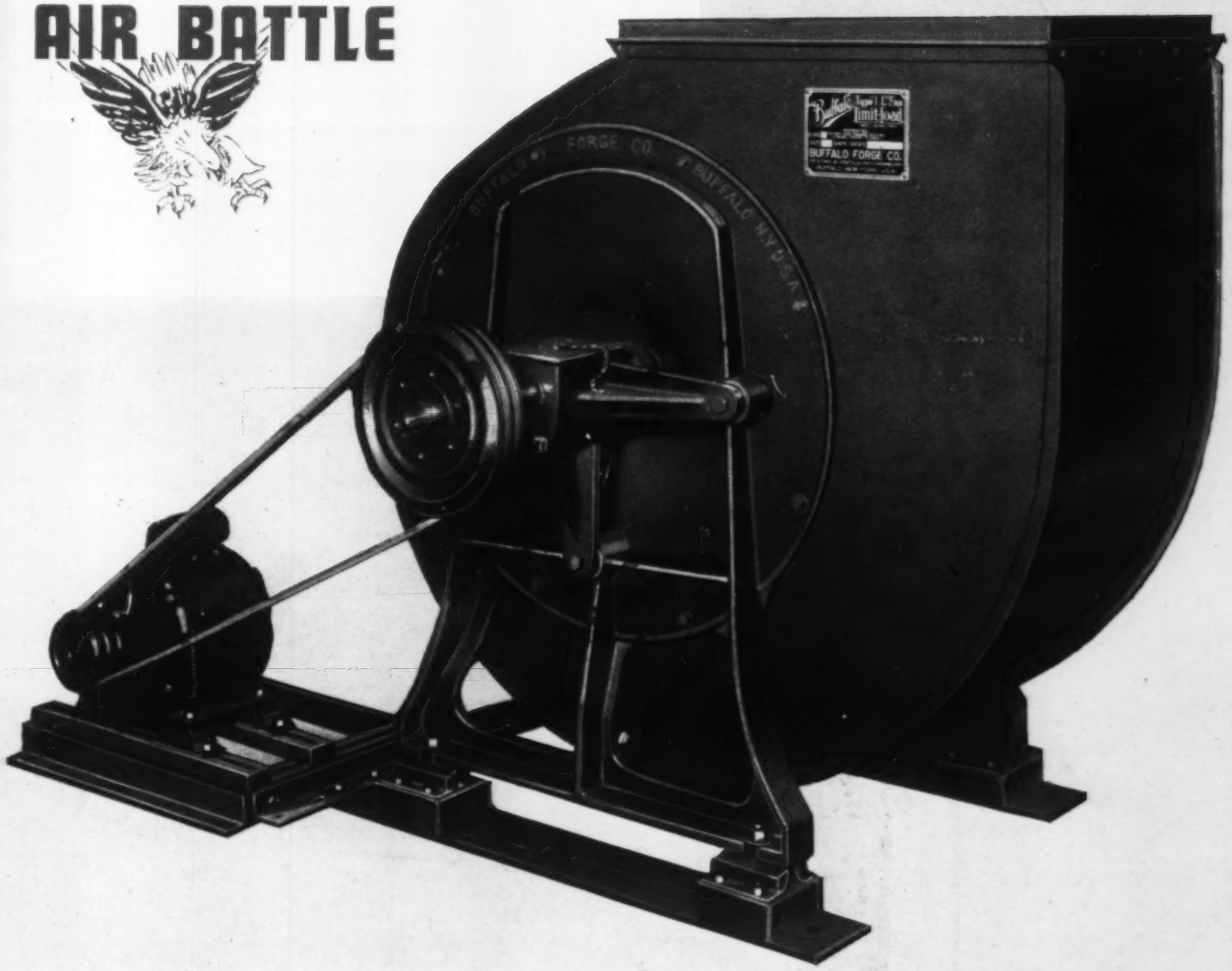
IF YOU'RE IN WAR WORK and need anti-friction bearings for any type of job TURN TO BANTAM. The Bantam line includes every major type of bearing—straight roller, tapered roller, needle and ball. Our engineers will be glad to work with yours in meeting today's needs and planning tomorrow's designs. Call us if we may be of help on any type of anti-friction bearing problem.

BANTAM BEARINGS

STRAIGHT ROLLER · TAPERED ROLLER · NEEDLE · BALL

BANTAM BEARINGS CORPORATION • SOUTH BEND • INDIANA

WINNING ANOTHER AIR BATTLE



Clean, fresh air is a vital factor in the Battle of Production—and Buffalo Fans are the "armament" of ventilation. Silently, efficient Buffalo equipment like the Type LL Limit-Load Fan shown above—is providing clean, abundant air in hundreds of war production plants. Through frequent air changing every hour of the day and night, Buffalo Fans insure comfortable working conditions, keep plant personnel alert and efficient, step-up output. Buffalo Fans are engineered for long years of trouble-free, economical service. Every detail of construction is amply matched to today's demands for all-out production activity.

BUFFALO FORGE COMPANY

148 Mortimer St., Buffalo, N. Y. Branch Offices in Principal Cities

Canadian Blower & Forge Co. Ltd., Kitchener, Ont.

"Buffalo" VENTILATING FANS

In designing new machines of any kind, or redesigning existing ones, don't permit half-measures to prevail—especially when it comes to specifying Timken Tapered Roller Bearings.

Put in as many Timken Bearings as possible; then you will be sure of getting Timken Bearing benefits in full—maximum speed, maximum precision, maximum endurance, maximum operating and maintenance economies.

Furthermore, you will have machines that *sell* as well as they perform—for no name in bearings enjoys such buyer preference as "TIMKEN". In fact it is regarded as a sure sign of quality in any piece of equipment with which it is associated.

If you are a machine designer, remember you owe it to your employer to see that he gets this tremendous advantage.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

HELP ASSURE VICTORY

Buy War Bonds. Conserve Rubber. Eliminate Unnecessary Travel. Use the Telephone Only When Important. Salvage All Scrap and Waste Material.

All Timken Bearing production now goes into fighting machines. However, the Timken Bearings in your motor vehicles or industrial machines will see you through the emergency—and beyond it—if you make sure they are lubricated and inspected regularly.

Headstock end of Le Blond No. 5 Combination Gun Boring and Turning Lathe machining a 90 mm anti-aircraft gun. Spindle mounted on Timken Bearings.

TIMKEN
TAPERED ROLLER BEARINGS